Service Manual

3G Storm Series® Wheelchairs

Arrow® RWD
Torque™ SP RWD
Ranger X™ RWD

DEALER: KEEP THIS MANUAL. THE PROCEDURES IN THIS MANUAL MUST BE PERFORMED BY AN AUTHORIZED DEALER ONLY

INVACARE®

WARNING

WARNING

THE PROCEDURES IN THIS MANUAL SHOULD ONLY BE PERFORMED BY A QUALIFIED SERVICE TECHNICIAN.

DO NOT SERVICE OR OPERATE THIS EQUIPMENT WITHOUT FIRST READING AND UNDERSTANDING THIS MANUAL AND THE OWNER'S MANUAL SUPPLIED WITH THE WHEELCHAIR. IF YOU ARE UNABLE TO UNDERSTAND THE WARNINGS, CAUTIONS, AND INSTRUCTIONS, CONTACT INVACARE TECHNICAL SUPPORT BEFORE ATTEMPTING TO SERVICE OR OPERATE THIS EQUIPMENT - OTHERWISE INJURY OR DAMAGE MAY RESULT.

SPECIAL NOTES

SPECIAL NOTES

WARNING/CAUTION notices as used in this manual apply to hazards or unsafe practices which could result in personal injury or property damage.

NOTICE

THE INFORMATION CONTAINED IN THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE.

WHEELCHAIR USER

As a manufacturer of wheelchairs, Invacare endeavors to supply a wide variety of wheelchairs to meet many needs of the end user. However, final selection of the type of wheelchair to be used by an individual rests solely with the user and his/her healthcare professional capable of making such a selection.

WHEELCHAIR TIE-DOWN RESTRAINTS AND SEAT POSITIONING STRAPS

Invacare recommends that wheelchair users NOT be transported in vehicles of any kind while in wheelchairs. As of this date, the Department of Transportation has not approved any tie-down systems for transportation of a user while in a wheelchair, in a moving vehicle of any type.

It is Invacare's position that users of wheelchairs should be transferred into appropriate seating in vehicles for transportation and use be made of the restraints made available by the auto industry. Invacare cannot and does not recommend any wheelchair transportation systems.

AS REGARDS RESTRAINTS - SEAT POSITIONING STRAPS - IT IS THE OBLIGATION OF THE DME DEALER, THERAPISTS AND OTHER HEALTHCARE PROFESSIONALS TO DETERMINE IF A SEATING POSITIONING STRAP IS REQUIRED TO ENSURE THE SAFE OPERATION OF THIS EQUIPMENT BY THE USER. SERIOUS INJURY CAN OCCUR IN THE EVENT OF A FALL FROM A WHEELCHAIR.

SAVE THESE INSTRUCTIONS

TABLE OF CONTENTS

NOTE: The information in this owner's manual applies to the STORM ARROW, STORM TORQUE X, RANGER X, and the RECLINER Wheelchairs except where specified.

SPECIAL NOTES **2**
SPECIFICATIONS
FOR ARROW **5**
FOR TORQUE SP **6**
FOR RANGER X **7**
PROCEDURE 1 - GENERAL GUIDELINES **8**
REPAIR OR SERVICE INFORMATION 8
OPERATING INFORMATION 8
WARNING/CAUTION LABEL LOCATION 10
PROCEDURE 2 - TROUBLESHOOTING **12**
FIELD LOAD TEST 12
USING HYDROMETER TO CHECK BATTERY CELLS (LEAD ACID) 12
MOTOR TESTING 13
MOTOR BRUSH INSPECTION 14
ELECTRO-MECHANICAL PARKING BRAKE TESTING 14
PROCEDURE 3 - HARDWARE TORQUE SPECIFICATIONS **15**
STANDARD SEAT FRAME 15
CAPTAINS VAN SEAT 16
ADJUSTABLE SEAT FRAME 16
BASE FRAME HARDWARE TORQUE SPECIFICATIONS 17
PROCEDURE 4 - **ARMS** 18
REPLACING ARMREST PADS - CAPTAINS VAN SEAT 18
REPLACING CAPTAINS VAN SEAT ARMREST PLATE 18
PROCEDURE 5 - UPHOLSTERY/POSITIONING STRAP **19**
REPLACING SEAT POSITIONING STRAP - CAPTAINS VAN SEATS 19
REPLACING BACK UPHOLSTERY 19
PROCEDURE 6 - SEAT FRAME **21**
PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME AND CAPTAINS VAN SEAT 21
REPLACING EXACT SAME SIZE STANDARD SEAT FRAME 22
REMOVING/INSTALLING STANDARD SEAT FRAME SUB-ASSEMBLY 22
CHANGING SEAT DEPTH 23
CHANGING SEAT WIDTH (STANDARD AND ADJUSTABLE SEAT FRAME) 25
INSTALLING/REMOVING ADJUSTABLE SEAT FRAME SUBASSEMBLY AND/OR COMPONENT REPLACEMENT 26
INSTALLING/REMOVING CAPTAINS VAN SEAT ASSEMBLY 28
REPLACING CAPTAINS VAN SEAT AND/OR CAPTAINS VAN SEAT FRAME 28
CONVERTING FROM STANDARD SEAT FRAME TO ADJUSTABLE SEAT FRAME OR VICE VERSA 29
CONVERTING FROM ADJUSTABLE SEAT FRAME TO CAPTAINS VAN SEAT OR VICE VERSA 29
CONVERTING FROM STANDARD SEAT FRAME TO CAPTAINS VAN SEAT OR VICE VERSA 30
REMOVING/INSTALLING SEAT PAN 30
MOUNTING PLATE - SEAT ANGLE ADJUSTMENT AND INSTALLATION ORIENTATION 31
PROCEDURE 7 - BASE FRAME **32**
REPLACING SEAT MOUNTING PLATES 32
REPLACING SEAT SUPPORT BRACKETS 32
REPLACING SEAT SUPPORT BRACKET T-NUTS 33
REPLACING BATTERY CHARGER BRACKET AND T-NUT 34
REMOVING/INSTALLING SEAT STOP SCREWS 34
PROCEDURE 8 - BACK FRAME **35**
REPLACING CJ BACK BRACKETS 35
CHANGING BACK HEIGHT 36
BACK ANGLE ADJUSTMENT 38

TABLE OF CONTENTS (Continued)

PROCEDURE 9 - BATTERIES 39
INSTALLING/REMOVING BATTERIES INTO/FROM BATTERY BOX(ES) 39
DISCONNECTING/CONNETING BATTERY CABLES 40
WHEN TO CHARGE BATTERIES 44
CHARGING BATTERIES 44
REPLACING BATTERIES 46
REMOVING/INSTALLING GROUP 24 BATTERY BOXES FOR WHEELCHAIRS NOT EQUIPPED WITH VENT TRAY 47
REMOVING/INSTALLING GROUP 24 BATTERY BOXES FOR WHEELCHAIRS NOT EQUIPPED WITH VENT TRAY 48
INSTALLING/REMOVING BATTERY BOX - 22NF BATTERY BASE FRAME 49

PROCEDURE 10 - WIRING HARNESS 50
REMOVING/INSTALLING THE WIRING HARNESS 50
ADJUSTING LIMIT SWITCH 54

PROCEDURE 11 - RETENTION STRAP/RETAINER 55
REPLACING BATTERY BOX RETAINER/RETAINER CLIP - GROUP 24 BATTERY BASE FRAMES .. 55

PROCEDURE 12 - WHEELS/MOTORS 57
REPLACING PNEUMATIC TIRES/TUBES - DRIVE WHEELS/CASTERS 57
REMOVING/INSTALLING DRIVE WHEELS 57
REMOVING/INSTALLING DRIVE WHEEL HUB 58
INSTALLING WHEEL LOCK BRACKET ONTO WHEEL CHAIR 58
REMOVING/INSTALLING CASTERS 59
REPLACING FORKS 59
REMOVING/INSTALLING THE MOTOR (CONVENTIONAL MOTOR WITH GEARBOX) 60
REMOVING/INSTALLING THE MOTOR (GEARLESS BRUSHLESS MOTOR) 61

PROCEDURE 13 - ELECTRONICS 66
REPOSITIONING MKIV JOYSTICK - VAN SEAT MODELS 63
REMOVING/INSTALLING MKIV CONTROLLER 64

PROCEDURE 14 - RECLINER 68
POSITIONING LIMIT SWITCH 68
ADJUSTING LIMIT SWITCH 68
REPLACING RECLINER CABLE ASSEMBLIES 69
REPLACING/ADJUSTING GAS CYLINDERS 70
CHANGING BACK HEIGHT 71
CHANGING SEAT DEPTH 72
CHANGING SEAT WIDTH 72
EQUIPMENT OPTION INSTALLING/REPLACING ADJUSTABLE 16 TO 19-INCH DEEP RECLINER SEAT FRAME ONTO ARROW OR X BASE FRAME 73

PROCEDURE 16 - RWD WHEELCHAIRS 74
REMOVING/INSTALLING GROUP 24 BATTERY BOX SUB-FRAME 74
REMOVING/INSTALLING 22NF BATTERY BOX TRAY 76
EQUIPMENT OPTION CONVERTING 22NF BATTERY BOX TRAY TO GROUP 24 BATTERY BOX SUB FRAME 76
SHOCK OR RUBBER ELEMENT REPLACEMENT FOR WHEELCHAIRS EQUIPPED WITH GROUP 24 BATTERIES 79
SHOCK OR RUBBER ELEMENT REPLACEMENT FOR WHEELCHAIRS EQUIPPED WITH 22NF BATTERIES 81
SHOCK SPRING REPLACEMENT 82
REMOVING/INSTALLING GEARBOX 83
ADJUSTING WEIGHT DISTRIBUTION 84
REPOSITIONING MOTOR/GEARBOX 85
REPOSITIONING THE GEARLESS/BRUSHLESS MOTOR 86
REPLACING SUSPENSION ARM FOR WHEELCHAIRS WITH MOTOR/GEARBOX ASSEMBLY 87
REPLACING THE SUSPENSION ARM FOR WHEELCHAIRS WITH GEARLESS/BRUSHLESS MOTOR . 88
ANTI-TIPPER WHEEL REPLACEMENT 89
REMOVING INSTALLING THE ANTI-TIP ASSEMBLY 89

LIMITED WARRANTY 91

SPECIFICATIONS FOR ARROW

Seat Width Range:	
Standard	12 to 24-inches
Recliner	14 to 24-inches
Seat Depth Range:	
Standard	12 to 22-inches
Recliner	14 to 22-inches
Back Height Range:	
Standard	12 to 24-inches
Recliner	18-1/2 to 26-inches
Back Angle Range:	
Standard	80° to 115°
Recliner	90° to 170°
Seat-to-Floor (approximate)	
Standard:	17-1/2 -inches
Optional:	19-3/4-inches 21-inches
Overall Width of Base (w/o joystick)	25-inches
Overall Height	
Standard:	34-1/4-inches
Minimum:	34-1/4-inches
Maximum:	44-1/4-inches
Recliner	
Low Seat Frame:	51-1/2-inches
Med. Seat Frame:	53-3/4-inches
High Seat Frame:	55-1/2 inches
Overall Length (without front riggings)	
Standard:	29-1/2-inches
Long Frame:	32-1/2-inches
Weight	
Gearless/Brushless Motor	
W/O GP24 Batteries:	174 lbs.
With GP24Batteries:	278 lbs.
Shipping (approx.):	214 lbs.
4 Pole Motor	
Without Batteries:	162 lbs.
With Batteries:	266 lbs.
Shipping (approx.):	202 lbs.

Drive Axle:	◆Adjustable

◆ *Non-Recliners ONLY.*

Drive Wheels/Tires: (Foam Filled or Pneumatic)	
Standard:	14 X 3-inches
Optional:	14 X 4-inches

PHYSICAL DIMENSIONS

Casters w/Precision Sealed Bearings

Semi-Pneumatic	
Standard:	8 X 2-1/4-inches
Option:	6 X 2-inches (w/ shock fork)
Pneumatic or Foam Filled	
Standard:	8 X 2-inches
Option:	9 X 2-3/4-inches

Anti-Tippers (3-inch wheels): Standard

Caster Forks: Standard, Shock Fork (Optional)

Footrests: Telescoping Front Rigging Supports, Swing-Away (Std), Heavy Duty (Opt.), 2-in. and 4-in. longer Pivot Slide Tube (Opt)

Armrests: Flip Back, Fixed or Adjustable Height (Desk and Full Length)

Seat Angle Adjustment: Adjustable (0° to 10°)

Back Angle Adjustment: Adjustable (80° to 115° in 5° increments)

Seat Cushion: Cushion (Optional)

Chair Upholstery Options: Naugahyde and Nylon

Battery requirements: See chart on page 46

Weight Limitations: Arrow with gearless/brushless motor - up to 300 lbs. Arrow with 4 pole motor - up to 400 lbs.

PERFORMANCE

RATING	SPEED		RANGE
	G/B motor	4 Pole Motor	
300 lbs	up to 8 mph	N/A	up to 29
400 lbs	N/A	up to 4.5 mph	up to 19

Range will vary with battery conditions, surface, terrain and operators weight.

SPECIFICATIONS - TORQUE SP

SPECIFICATIONS

Seat Width Range:

Standard	12 to 22-inches
Recliner	14 to 22-inches

Seat Depth Range:

Standard	12 to 22-inches
Recliner	16 to 22-inches

Back Height Range:

Standard	12 to 24-inches
Recliner	18-1/2 to 26-inches

Back Angle Range:

Standard	80^{o} to 115^{o}
Recliner	90^{o} to 170^{o}

Seat-to-Floor (approximate)

Standard:	17-1/2-inches
Optional:	19-3/4-inches
	21-inches

Overall Width of Base (w/o joystick) 25-inches

Overall Height

Standard:	34-1/4-inches
Minimum:	34-1/4-inches
Maximum:	44-1/4-inches
Recliner	
Low Seat Frame:	51-1/2-inches
Med. Seat Frame:	53-3/4-inches
High Seat Frame:	55-1/2 inches

Overall Length (without front riggings)

Standard:	29-1/2-inches
Long Frame:	32-1/2-inches

Drive Axle: ◆Adjustable

◆ *Non-Recliners ONLY.*

Drive Wheels/Tires: (Foam Filled or Pneumatic)

Standard:	14 X 3-inches
Optional:	14 X 4-inches

PHYSICAL DIMENSIONS

Casters w/Precision Sealed Bearings

Semi-Pneumatic

Standard:	8 X 1-1/4-in
Option:	6 X 2-in.(w/ shock fork)

Pneumatic or Foam Filled

Standard:	8 X 2-inches
Option:	9 X 2-3/4-inches

Anti-Tippers (3-inch wheels): Standard

Caster Forks: Standard, Shock Fork (Optional)

Footrests: Telescoping Front Rigg Supports, Swing-Away, Heavy Duty, 4-in. longer Pivot Slide Tube (Opt)

Armrests: Flip Back, Fixed or Adjustable Height (Desk and Full Length)

Seat Angle Adjustment: Adjustable (0^{o} to 10^{o})

Back Angle Adjustment: Adjustable (80^{o} to 115^{o} in 5^{o} increments)

Seat Cushion: Cushion (Optional)

Chair Upholstery Options: Naugahyde and Nylon

PERFORMANCE

RATING	SPEED		RANGE
	G/B motor	4 Pole Motor	
250 lbs	N/A	up to 4.5 mph	up to 19
251-300 lbs	up to 8 mph		up to 29
		up to 4.5 mph	up to 19
301-350 lbs	N/A	up to 4.5 mph	up to 19

Range will vary with battery conditions, surface, terrain and operators weight.

BATTERY REQUIREMENTS , WEIGHT LIMITATIONS, CHAIR WEIGHT

MODEL	MOTOR	WEIGHT LIMITATION	BATTERIES	CHAIR WEIGHT W/O BATT.	CHAIR WEIGHT W/ BATT.	SHIPPING WEIGHT
U250TQ	4 Pole Motor	Up to 250 lbs	*22NF	154	228	194 lbs
251-300TQ	4 Pole Motor	251-300 lbs	*22 NF	154	228	194 lbs
251-300TQ	Gearless/Brushless	251-300 lbs	Group 24	166	270	206 lbs
301-350TQ	4 Pole Motor	301-350 lbs	Group 24	154	258	194 lbs

* Two batteries inside one battery box.

SPECIFICATIONS - RANGER X

Seat Width Range:

Standard	12 to 22-inches
Recliner	14 to 22-inches

Seat Depth Range:

Standard	12 to 22-inches
Recliner	14 to 22-inches

Back Height Range:

Standard	12 to 24-inches
Recliner	18-1/2 to 26-inches

Back Angle Range:

Standard	80^{o} to 115^{o}
Recliner	90^{o} to 170^{o}

Seat-to-Floor (approximate)

Standard:	17-1/2-inches
Optional:	19-3/4-inches
	21-inches

Overall Width of Base (w/o joystick) 25-inches

Overall Height

Standard:	34-1/4-inches
Minimum:	34-1/4-inches
Maximum:	44-1/4-inches
Recliner	
Low Seat Frame:	51-1/2-inches
Med. Seat Frame:	53-3/4-inches
High Seat Frame:	55-1/2 inches

Overall Length (without front riggings)

Standard:	29-1/2-inches
Long Frame:	32-1/2-inches

Weight

Gearless/Brushless Motor	
Without GP 24 Batteries:	174 lbs.
With GP 24 Batteries:	278 lbs.
Shipping (approx.):	214 lbs.
4 Pole Motor	
Without GP 24 Batteries:	162 lbs.
With GP 24 Batteries:	266 lbs.
Shipping (approx.):	202 lbs.

Drive Axle: ◆Adjustable

◆ *Non-Recliners ONLY.*

Drive Wheels/Tires: (Foam Filled or Pneumatic)

Standard:	14 X 3-inches
Optional:	14 X 4-inches

PHYSICAL DIMENSIONS

Casters w/Precision Sealed Bearings

Semi-Pneumatic

Standard:	8 X 2-1/4-in
Option:	6 X 2-in. (w/ shock fork)

Pneumatic or Foam Filled

Standard:	8 X 2-inches
Option:	9 X 2-3/4-inches

Anti-Tippers (3-inch wheels): Standard

Caster Forks: Standard, Shock Fork (Optional)

Footrests: Telescoping Front Rigging Supports, Swing-Away (Std), Heavy Duty (Opt.), 4-in. longer Pivot Slide Tube (Opt)

Armrests: Flip Back, Fixed or Adjustable Height (Desk and Full Length)

Seat Angle Adjustment: Adjustable (0^{o} to 10^{o})

Back Angle Adjustment: Adjustable (80^{o} to 100^{o} in 5^{o} increments)

Seat Cushion: Cushion (Optional)

Chair Upholstery Options: Naugahyde and Nylon

Battery requirements: Group 24

Weight Limitations: 300 lbs.

PERFORMANCE

RATING	SPEED		RANGE
	G/B motor	4 Pole Motor	
300 lbs		up to 6.5 mph	up to 19
	up to 8.0 mph		up to 29

Range will vary with battery conditions, surface, terrain and operators weight.

This Procedure Includes the Following:
Repair or Service Information *Operating Information* *Safety/Handling of Wheelchairs*

REPAIR OR SERVICE INFORMATION

Set-up of the Electronic Control Unit is to be performed ONLY by individuals certified by Invacare. The final tuning adjustments of the controller may affect other activities of the wheelchair. Damage to the equipment could occur under these circumstances. If non-certified individuals perform any work on these units, the warranty is void.

OPERATING INFORMATION

GENERAL WARNINGS

Performance adjustments should only be made by professionals of the healthcare field or persons fully conversant with this process and the driver's capabilities. Incorrect settings could cause injury to the driver, bystanders, damage to the chair and to surrounding property.

After the wheelchair has been set-up, check to make sure that the wheelchair performs to the specifications entered during the set-up procedure. If the wheelchair does NOT perform to specifications, turn the wheelchair OFF immediately and reenter set-up specifications. Repeat this procedure until the wheelchair performs to specifications.

DO NOT operate on roads, streets or highways.

DO NOT climb, go up or down ramps or traverse slopes greater than 9°.

DO NOT attempt to move up or down an incline with a water, ice or oil film.

DO NOT attempt to drive over curbs or obstacles. Doing so may cause your wheelchair to turn over and cause bodily harm or damage to the chair.

DO NOT use parts, accessories, or adapters other than those authorized by Invacare.

DO NOT leave the power button ON when entering or exiting your wheelchair.

DO NOT stand on the frame of the wheelchair.

DO NOT use the footplates as a platform. When getting in or out of the wheelchair, make sure that the footplates are in the upward position or swing footrests towards the outside of the chair.

ALWAYS wear your seat positioning strap.

TIRE PRESSURE

DO NOT use your wheelchair unless it has the proper tire pressure (P.S.I.). DO NOT overinflate the tires. Failure to follow these suggestions may cause the tire to explode and cause bodily harm. The recommended tire pressure is listed on the side wall of the tire.

GENERAL WARNINGS (CONTINUED)

ELECTRICAL

Grounding Instructions:

DO NOT, under any circumstances, cut or remove the round grounding prong from any plug used with or for Invacare products. Some devices are equipped with three-prong (grounding) plugs for protection against possible shock hazards. Where a two-prong wall receptacle is encountered, it is the personal responsibility and obligation of the customer to contact a qualified electrician and have the two-prong receptacle replaced with a properly grounded three-prong wall receptacle in accordance with the National Electrical Code. If you must use an extension cord, use ONLY a three-wire extension cord having the same or higher electrical rating as the device being connected. In addition, Invacare has placed RED/ORANGE WARNING TAGS on some equipment. DO NOT remove these tags.

BATTERIES

The warranty and performance specifications contained in this manual are based on the use of deep cycle gel cell or sealed lead acid batteries. Invacare strongly recommends their use as the power source for this unit.

Carefully read battery/battery charger information prior to installing, servicing or operating your wheelchair.

RAIN TEST

INVACARE has tested it's power wheelchairs in accordance with ISO 7176 Part 9 "Rain Test". This provides the end user or his/her attendant sufficient time to remove his/her power wheelchair from a rain storm and retain wheelchair operation.

DO NOT leave power wheelchair in a rain storm of any kind.

DO NOT use power wheelchair in a shower or leave it in a damp bathroom while taking a shower.

DO NOT leave power wheelchair in a damp area for any length of time.

Direct exposure to rain or dampness will cause the chair to malfunction electrically and mechanically; may cause the chair to prematurely rust.

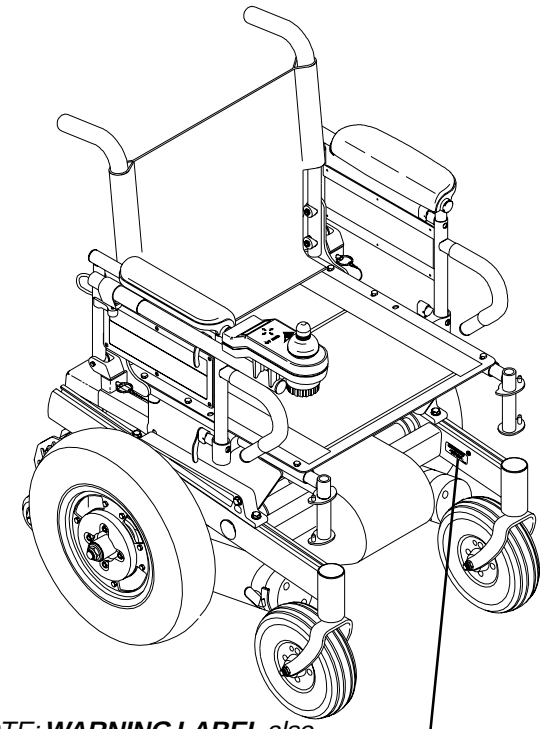
Check to ensure that the battery covers are secured in place, joystick boot is NOT torn or cracked where water can enter and that all electrical connections are secure at all times.

DO NOT use the joystick if the boot is torn or cracked. If the joystick boot becomes torn or cracked, replace IMMEDIATELY.

WEIGHT TRAINING

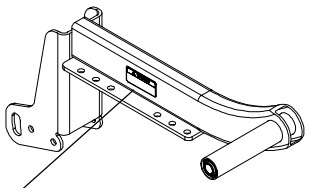
Invacare DOES NOT recommend the use of its wheelchairs as a weight training apparatus. Invacare wheelchairs have NOT been designed or tested as a seat for any kind of weight training. If occupant uses said wheelchair as a weight training apparatus, INVACARE SHALL NOT BE LIABLE FOR BODILY INJURY AND THE WARRANTY IS VOID.

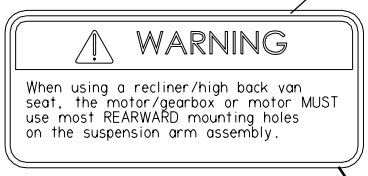
WARNING/CAUTION LABEL LOCATION



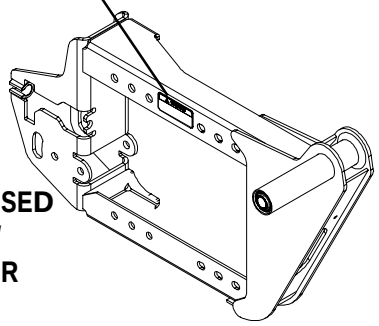
*NOTE: **WARNING LABEL** also found on side frame near the rear of the chair.*

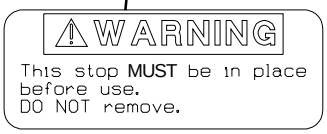
SUSPENSION ARM USED WITH CONVENTIONAL MOTOR/GEARBOX ASSEMBLY




WARNING
When using a recliner/high back van seat, the motor/gearbox or motor MUST use most REARWARD mounting holes on the suspension arm assembly.

SUSPENSION ARM USED WITH GEARLESS/ BRUSHLESS MOTOR

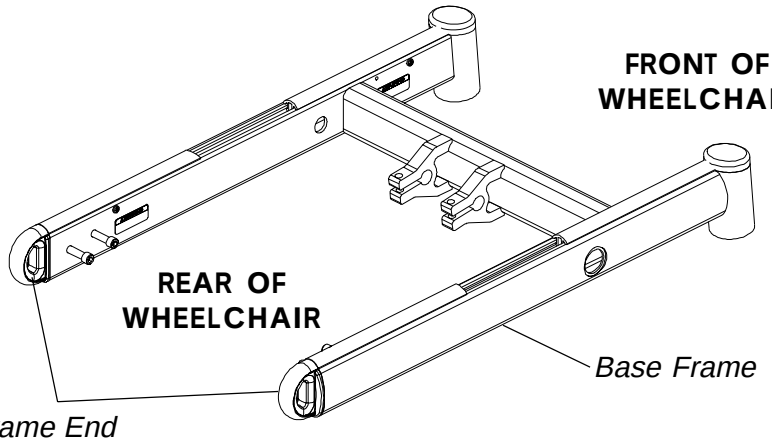




SHIPPING TIE DOWN RESTRAINTS

Invacare recommends that wheelchair users NOT be transported in vehicles of any kind while in wheelchairs. As of this date, the Department of Transportation has not approved any tie-down systems for transportation of a user while in a wheelchair, in a moving vehicle of any type.

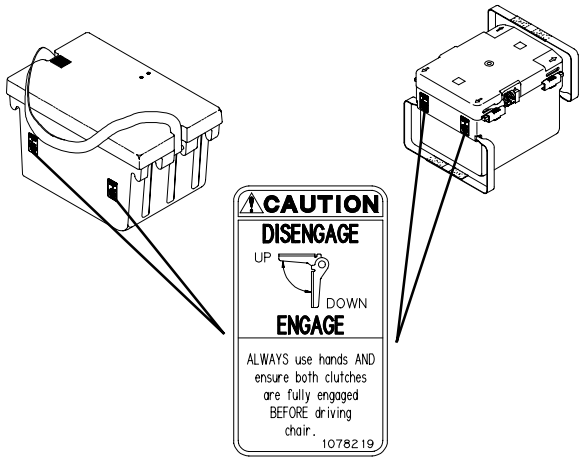
Frame end cap can only be used as a shipping tie-down point for an UNOCCUPIED wheelchair.



WARNING/CAUTION LABEL LOCATION

NOTE: These caution labels are only found on battery boxes used with the gearless/brushless motor

GROUP 24 BATTERIES **22NF BATTERIES**



This Procedure Includes the Following:
Field Load Test
Using Hydrometer To Check Battery Cells (Lead Acid)
Motor Testing
Motor Brush Inspection
Electro-Mechanical Parking Brake Testing

FIELD LOAD TEST (FIGURE 1)

*NOTE: The following test can also be performed through the controller of the wheelchair along with a remote programmer. Refer to the individual **CONTROLLER MANUAL** supplied with each wheelchair.*

Old batteries lose their ability to store and release power, due to increased internal resistance. This means that as you try to take power from the battery, some of that power is used up in the process of passing through the battery, resulting in less voltage at the posts. The more power drawn, the lower the voltage available. When this lost voltage drops the output 1.0 volts under load (2.0 for a pair), replace the batteries.

Testing under load is the only way to spot this problem. While special battery load testing equipment is available, it is costly and difficult to transport.

Use a digital voltmeter to check battery charge level at the charger connector. It is located on the base of the wheelchair frame.

*NOTE: **READ** the instructions **CAREFULLY** before using the digital voltmeter.*

*NOTE: Invacare recommends that **ONLY** qualified service personnel perform this test.*

1. Ensure that power is OFF.
2. Make sure battery is fully charged. An extremely discharged battery will exhibit the same symptoms as a bad one.
3. Remove the footrests from the wheelchair and place the CASTERS of the wheelchair against a wall, workbench or other stationary object.
4. Place the voltmeter leads into the charger plug on the wheelchair. Most digital voltmeters are not affected by polarity, however, analog meters (meters with swinging needles) can be and should be used carefully. A good meter reading should be 25.5 to 26 VDC.
5. Have two (2) individuals (one [1] on each arm) apply as much downward pressure as possible on the arms of the wheelchair.
6. Turn the wheelchair ON and push the joystick forward, trying to drive the wheelchair through the stationary object. This puts a heavy load on the batteries as they try to push through the stationary object. Read the meter while the motors are straining to determine the voltage under load.

NOTE: If the voltage drops to less than 23.5 volts from a pair of fully charged batteries while under load, they should be replaced regardless of the unloaded voltages.

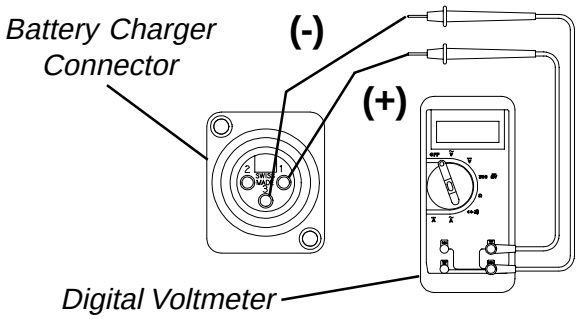


FIGURE 1 - FIELD LOAD TEST

USING HYDROMETER TO CHECK BATTERY CELLS (LEAD ACID) (FIGURE 2)

NOTE: Perform this procedure when a digital voltmeter is not available.

WARNING

NEVER smoke or strike a match near the batteries. If the caps of the battery cells are removed, NEVER look directly into them when charging the battery.

The use of rubber gloves and chemical goggles or face shields is recommended when working with batteries.

WARNING

When reading a hydrometer, DO NOT allow any liquid to come in contact with your eyes or skin. It is a form of acid and can cause serious burns, and in some cases, blindness. If you do get battery acid on you, flush the exposed areas with cool water IMMEDIATELY. If the acid comes into contact with eyes or causes serious burns, get medical help IMMEDIATELY.

The battery acid can damage your wheelchair, clothing, and household items. Therefore, take readings cautiously and only in designated areas.

ONLY use distilled water when topping off the battery cells.

Most batteries are not sold with instructions. However, warnings are frequently noted on the cell caps. Read them carefully.

1. Remove the battery box(es). Refer to INSTALLING/REMOVING BATTERY BOXES - GROUP 24 BATTERY BASE FRAMES or INSTALLING/REMOVING BATTERY BOX - 22NF BATTERY BASE FRAMES in PROCEDURE 9 of this manual.
2. Remove the battery caps from the battery.
3. Squeeze the air from the hydrometer.
4. Place the hydrometer into a battery cell.

*NOTE: **DO NOT** fill hydrometer more than 3/4 full.*

5. Draw up sufficient acid to cover float balls.
6. Tap lightly to remove air bubbles.
7. Number of floating balls indicates charge.

Number of Floating Balls

0	**Discharged**
1	**25% Charged**
2	**50% Charged**
3	**75% Charged**
4	**100% Charged**
*** 5**	**Overcharged**

*** Check charging system.**

8. Flush the liquid back into the same cell after reading the float. Repeat this step until all cells have been properly read. A shorted or dead cell can be detected when it is the only cell that does not charge.

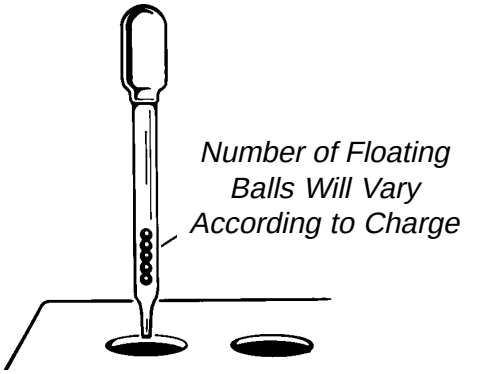


FIGURE 2 - USING HYDROMETER TO CHECK BATTERY CELLS (LEAD ACID)

9. Flush hydrometer in cold running water by allowing the water to rise into hydrometer as far as possible. Do this several times to guard against burn damage.
10. Replace the battery caps.
11. Reinstall battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES - GROUP 24 BATTERY BASE FRAMES or INSTALLING/REMOVING BATTERY BOX - 22NF BATTERY BASE FRAMES in PROCEDURE 9 of this manual.

MOTOR TESTING (FIGURE 3)

NOTE: This procedure should only be performed on wheelchairs with the conventional motor/gearbox assembly. For gearless/brushless motors, there are no serviceable parts. Return motor to manufacturer for testing.

1. On the 4-pin motor connector, locate the two (2) contacts in the red and black housings.
2. Set the digital multimeter to measure ohms (Ω).
3. Measure the resistance between the two (2) motor contacts.

NOTE: A normal reading is between 1 and 5 ohms (Ω). A reading of 0 ohms (Ω) or in excess of 15 ohms (Ω) indicates a problem. High readings are generally caused by bad connections and/or damaged brushes. Contact authorized dealer or Invacare.

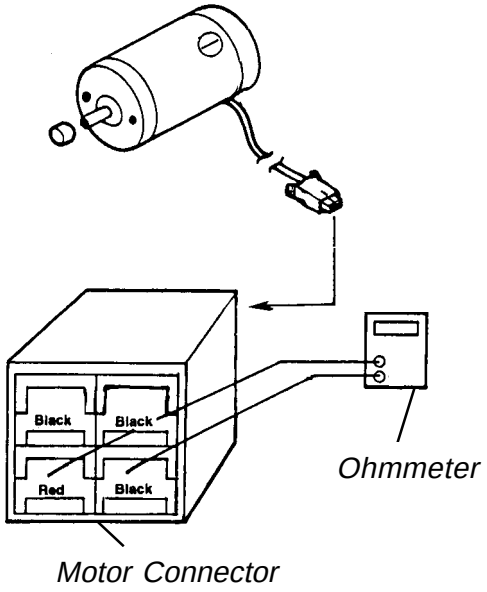


FIGURE 3 - MOTOR TESTING

MOTOR BRUSH INSPECTION (FIGURE 4)

NOTE: This procedure should only be performed on wheelchairs with conventional motor/gearbox assembly.

There are two (2) contact brushes on STORM motors located under the brush caps on the motor housing. If these caps are hard to remove they are either overtightened or the motor has become very hot. Let motors cool. If caps still cannot be removed, it is recommended that the motor be sent to Invacare Technical Services for inspection/repair.

*NOTE: It is very important to note which way the brush comes out of the motor. The brush **MUST** be placed into the motor exactly the same way to ensure good contact with the commutator.*

1. Once the motor brush caps have been removed, pull the brushes out of the motor. The end of the brushes should be smooth and shiny and the spring should not be damaged or discolored. If one or both of the brushes are damaged, only the damaged or worn brushes need be replaced. It is very important that any time a brush is replaced, it must be "burned in". This is accomplished by running the motor for one hour in each direction with a half hour break in-between. This should also be done with little or no load on the motor, i.e., put the wheelchair up on blocks so the drive (large) wheels do not contact the ground and run the wheelchair. A motor with only one brush replaced will only carry a small percentage of its rated load capacity until the NEW brush is burned in.

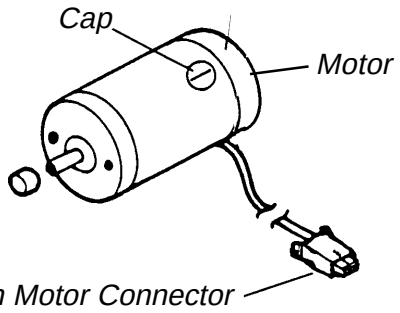


FIGURE 4 - MOTOR BRUSH INSPECTION

ELECTRO-MECHANICAL PARKING BRAKE TESTING (FIGURE 5)

NOTE: This procedure should only be performed on wheelchairs with conventional motor/gearbox assembly.

1. On the four-pin motor connector, locate the side by side connectors in the black housings.
2. Set the digital multimeter to read ohms (Ω).
3. Measure the resistance between the two (2) brake contacts. A normal reading is 100 ohms (Ω). A reading of 0 ohms (Ω) or a very high reading; i.e., MEG ohms or O.L. (out of limit) indicates a shorted brake or an open connection respectively. If either condition exists, send the motor to Invacare Technical Service for inspection/repair.

CAUTION

A shorted electro-mechanical brake will damage the brake output section in the controller. DO NOT connect a shorted electro-mechanical brake to a good controller module. A shorted brake MUST be replaced.

NOTE: A bad motor can damage the controller module but a bad controller will NOT damage a motor.

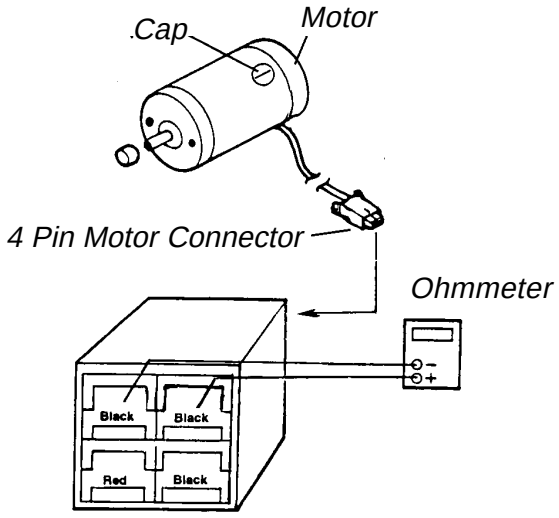
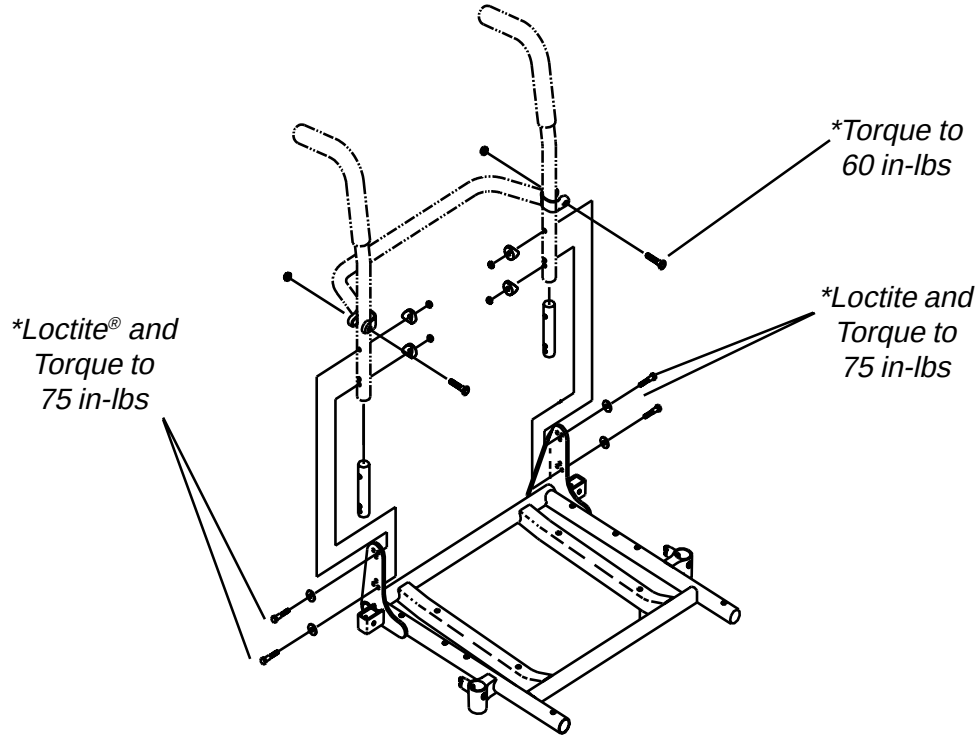
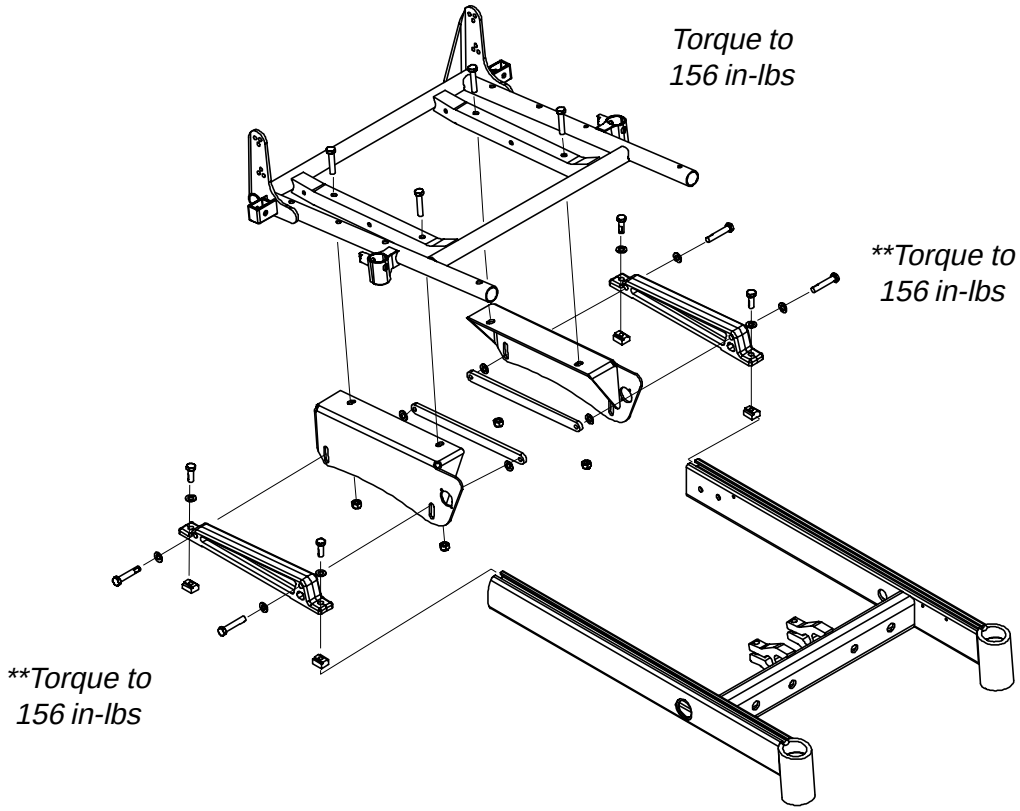


FIGURE 5 - ELECTRO-MECHANICAL PARKING BRAKE TESTING

HARDWARE TORQUE SPECIFICATIONS

STANDARD SEAT FRAME





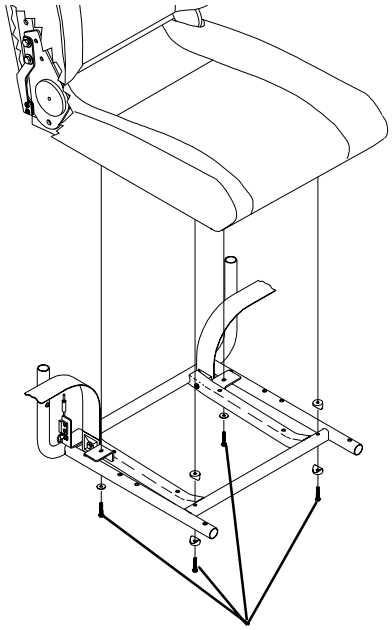
NOTE:

** These torque specifications also apply to the adjustable seat frame assembly.*

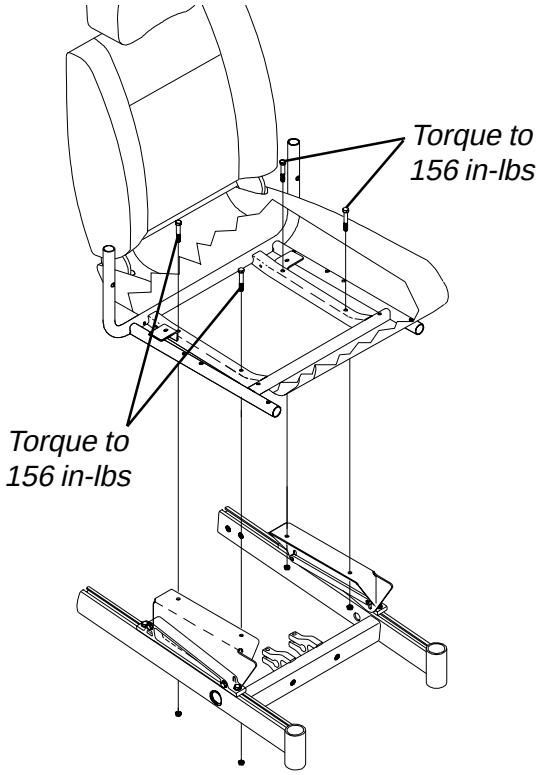
*** These torque specifications also apply to the captains van seat and adjustable seat frame assemblies.*

HARDWARE TORQUE SPECIFICATIONS

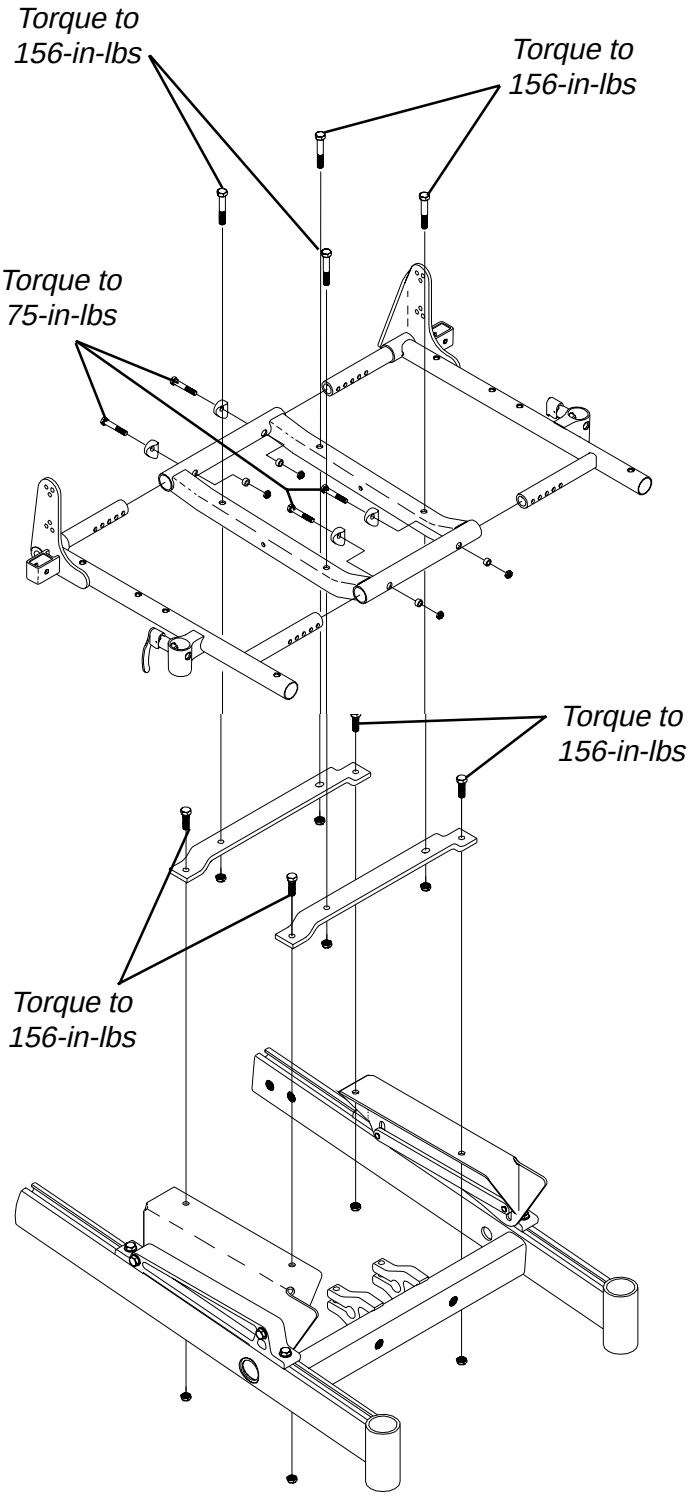
*CAPTAINS VAN SEAT



Loctite and Torque to 75 in-lbs

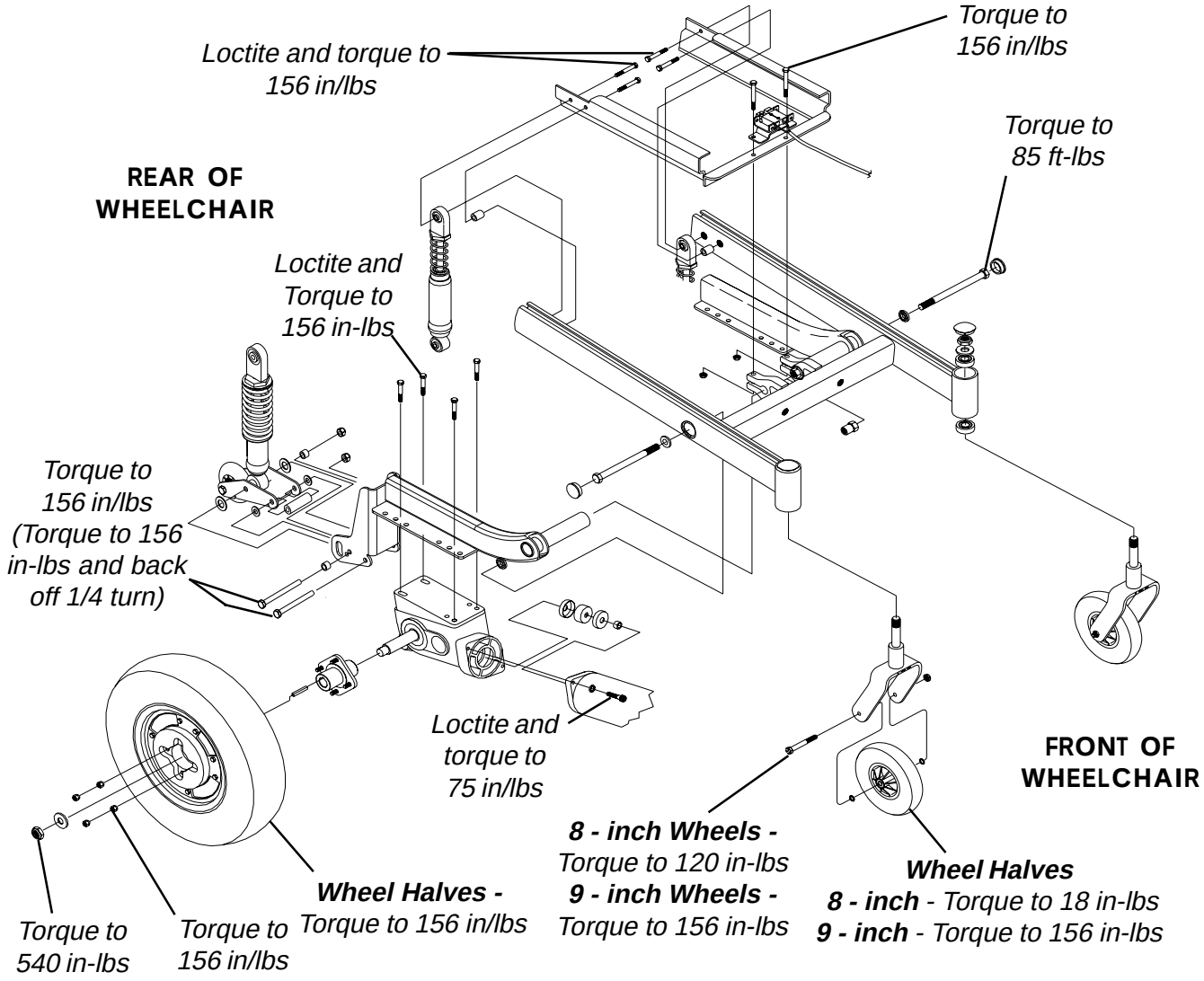


*ADJUSTABLE SEAT FRAME

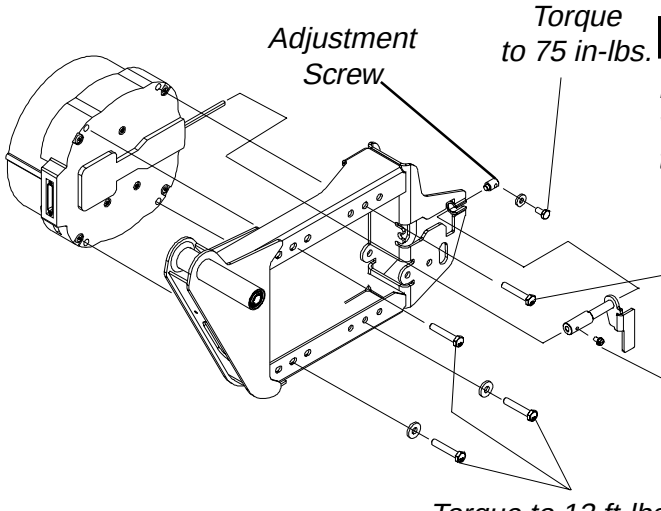


** NOTE: For additional torque specifications, refer to the torque specifications drawing for the standard seat frame assembly.*

BASE FRAME HARDWARE TORQUE SPECIFICATIONS


Loctite and torque to 156 in/lbs
Torque to 156 in/lbs
Torque to 85 ft-lbs
REAR OF WHEELCHAIR
Loctite and Torque to 156 in-lbs
Torque to 156 in/lbs (Torque to 156 in-lbs and back off 1/4 turn)
Loctite and torque to 75 in/lbs
FRONT OF WHEELCHAIR
8 - inch Wheels - Torque to 120 in-lbs
9 - inch Wheels - Torque to 156 in-lbs
Wheel Halves
8 - inch - Torque to 18 in-lbs
9 - inch - Torque to 156 in-lbs
Wheel Halves - Torque to 156 in/lbs
Torque to 540 in-lbs
Torque to 156 in/lbs

CONVENTIONAL MOTOR/GEARBOX



GEARLESS/BRUSHLESS MOTOR

NOTE: All torque specifications called out for the conventional motor/gearbox assembly are applicable to the gearless/brushless motor except for the following:

This Procedure Includes the Following:
Replacing Armrest Pads - Captains Van Seats
Replacing Captains Van Seat Armrest Plate

WARNING

After ANY adjustments, repair or service and BEFORE use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

REPLACING ARMREST PADS - CAPTAINS VAN SEATS (FIGURE 1)

1. Remove the mounting screws that secures the front of the armrest pad to the armrest plate.
2. Remove the mounting screw that secures the rear of the armrest pad and armrest insert to the armrest plate.
3. Remove the existing armrest pad and position the **NEW** armrest pad on the armrest plate.
4. Line up the mounting holes in the armrest insert, armrest plate and **NEW** armrest pad.
5. Reinstall the rear mounting screw through the armrest insert, armrest plate and armrest pad and tighten securely.
6. Reinstall the front mounting screw into the armrest plate and **NEW** armrest pad and tighten securely.

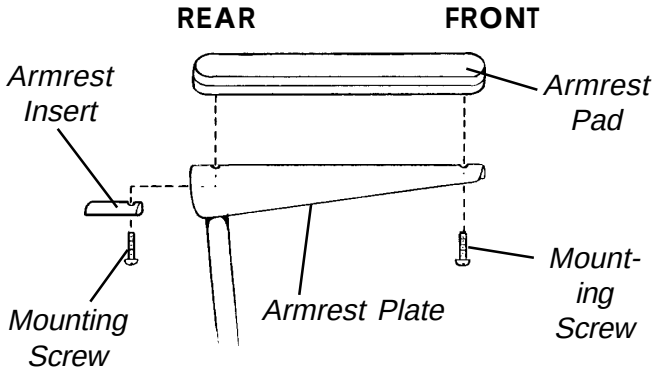


FIGURE 1 - REPLACING ARMREST PADS - CAPTAINS VAN SEATS

REPLACING CAPTAINS VAN SEAT ARMREST PLATE (FIGURE 2)

1. If necessary, remove the three (3) mounting screws, spacers and locknuts that secure the joystick mounting bracket to the armrest plate.
2. Remove armrest pad. Refer to REPLACING ARMREST PADS - CAPTAINS VAN SEATS in this procedure of the manual.
3. Remove the mounting screw, washers and locknut that secure the existing armrest plate to the arm weldment.
4. Position the **NEW** armrest plate on the armrest weldment and secure with the mounting screw, washers, and locknut. Refer to FIGURE 2 for correct hardware orientation.
5. Reinstall van style armrest pad. Refer to REPLACING ARMREST PADS - CAPTAINS VAN SEATS in this procedure of the manual.
6. If necessary, reinstall the three (3) mounting screws, spacers and locknuts that secure the joystick mounting bracket to the armrest plate.
7. Repeat STEPS 1-6 for the opposite armrest plate, if necessary.

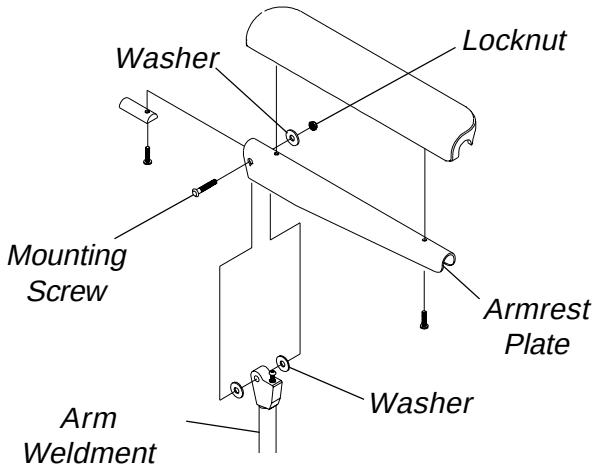


FIGURE 2 - REPLACING CAPTAINS VAN SEAT ARMREST PLATE

This Procedure Includes the Following:
Replacing Seat Positioning Strap - Captains Van Seats
Replacing Back Upholstery

WARNING

After ANY adjustments, repair or service and BEFORE use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

REPLACING SEAT POSITIONING STRAP - CAPTAINS VAN SEATS (FIGURE 1)

1. Remove the van style seat from the van seat frame. Refer to INSTALLING/REMOVING CAPTAINS VAN SEAT ASSEMBLY in PROCEDURE 6 of this manual.
2. Remove the two (2) rear mounting screws, washers, and locknuts that secure the seat positioning straps to the van seat frame.

NOTE: The washer is positioned between the seat positioning strap and the mounting screw.

3. Secure the **NEW** seat positioning strap halves with the mounting screws, washers and locknuts to the van seat frame and torque to 75-inch pounds.
4. Reinstall the van style seat to the van seat frame. Refer to INSTALLING/REMOVING CAPTAINS VAN SEAT ASSEMBLY in PROCEDURE 6 of this manual.

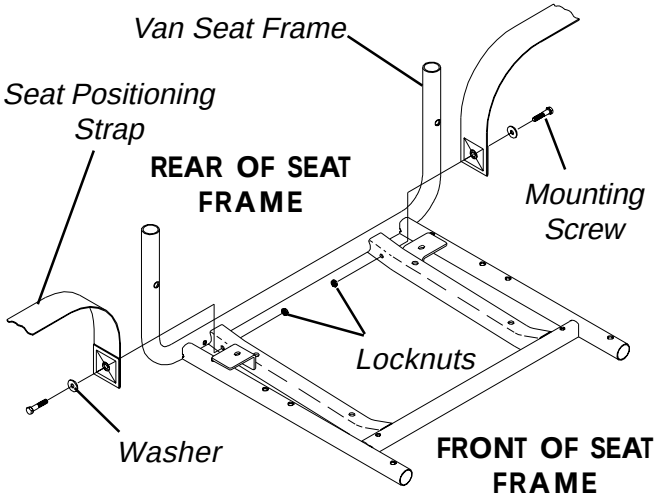


FIGURE 1 - REPLACING SEAT POSITIONING STRAP - CAPTAINS VAN SEATS

REPLACING BACK UPHOLSTERY (FIGURE 2)

1. Remove one (1) armrest from the wheelchair. Refer to INSTALLING/REMOVING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, 1081227.
2. If applicable, remove the two (2) mounting screws and locknuts that secure the spreader bar to the back canes.
3. Remove the two (2) mounting screws and washers that secure the existing back upholstery to the back canes.
4. Cut the tie-wraps that secure the bottom of the existing back upholstery to the back canes.

NOTE: Note the back angle before disassembly for proper reinstallation.

5. On the side of the wheelchair that the armrest was removed, remove one (1) of the mounting screws, washer, spacer, and locknut that secures the back cane to the seat frame.

NOTE: To avoid losing the insert in each back cane, thread the mounting screw just removed through the cane from the inside of the wheelchair to hold the insert in place.

6. Remove the other mounting screw, washer, spacer, and locknut that secures the back cane to the seat frame.
7. Slide the back cane out of the spreader bar (If applicable) and the existing back upholstery.
8. Remove other armrest from the chair. Refer to INSTALLING/REMOVING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, 1081227.
9. Repeat STEPS 5-7 for the opposite side of the wheelchair.
10. Slide the other back cane out of the spreader bar (if applicable) and the existing back upholstery.
11. Slide one(1) back cane into NEW back upholstery and through spreader bar (if applicable).
12. Secure back cane to the seat frame from the outside of the wheelchair with the existing two (2) mounting screws, washers, spacers, and locknuts. Use Loctite 242 and torque to 75-in/lbs.
13. Repeat STEPS 11-12 for opposite back cane.
14. Secure the top of the **NEW** back upholstery to the back canes with the two (2) existing mounting screws.

NOTE: When replacing the back upholstery, back assembly or changing back height, follow these guidelines for spreader bar height:

STANDARD MODELS

BACK HEIGHT	◆ SPREADER BAR HEIGHT
16-inches*	5-inches
17-inches*	5-inches
18-19-inches*	7-inches
20-24-inches	7-inches

*NOTE: Spreader Bar required on ALL back heights between 20-24-inches. *Spreader bar required on back heights 16,17,18, or 19 ONLY if the width or depth of the chair exceeds 19-inches.*

◆Height of Spreader Bar from Bottom of Back Canes to Top of Spreader Bar Clamp.

HEAVY DUTY MODELS

NOTE: Spreader bar required on all back heights.

BACK HEIGHT	◆ SPREADER BAR HEIGHT
16-17-inches	5-inches
18-24-inches	7-inches

◆Height of Spreader Bar from Bottom of Back Canes to Top of Spreader Bar Clamp.

15. If applicable, reposition the spreader bar at the correct height for the corresponding back height and torque the mounting hardware to 60-in/lbs.
16. Reinstall the armrest onto the wheelchair. Refer to INSTALLING/REMOVING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, 1081227.

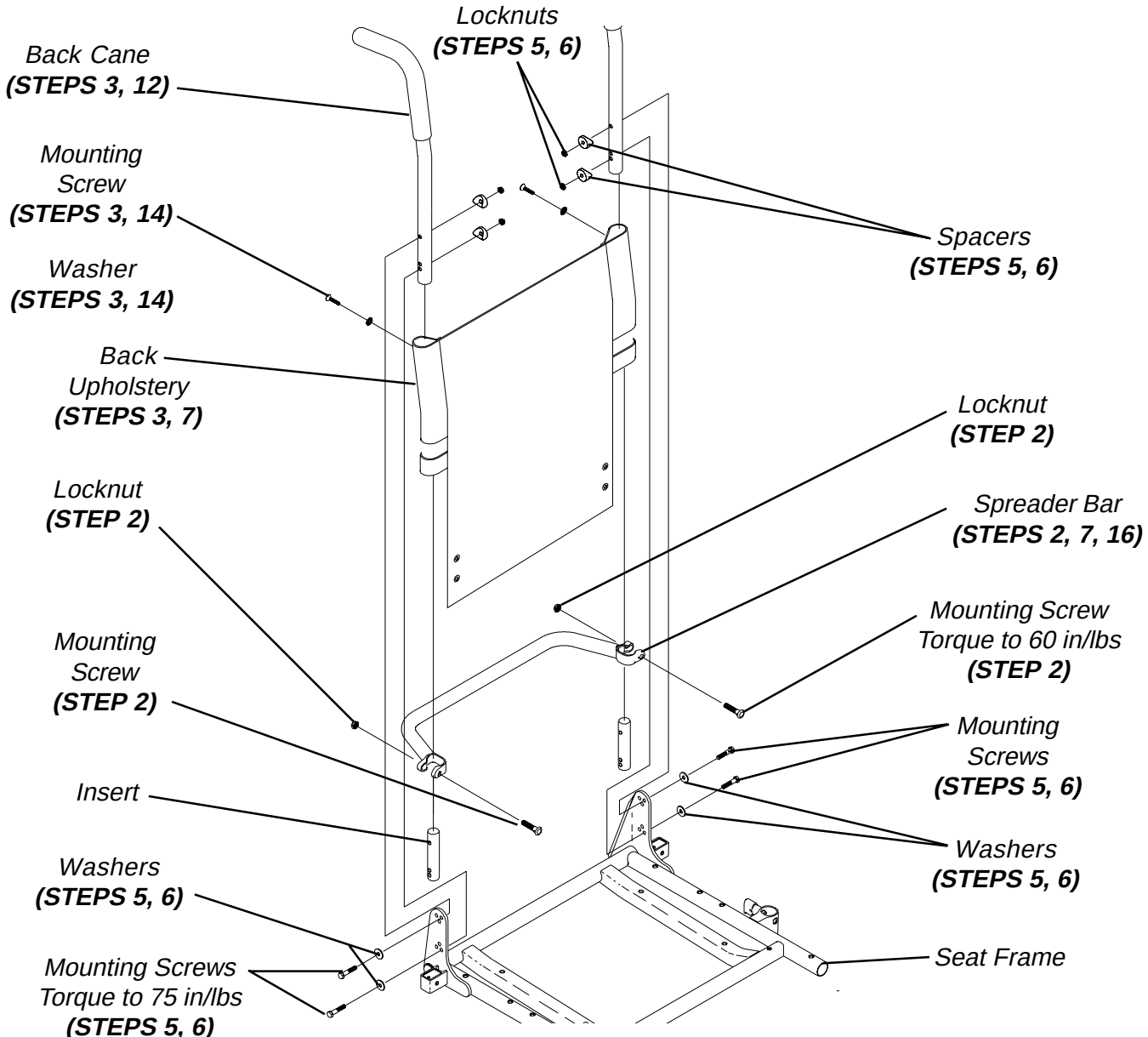


FIGURE 2 - REPLACING BACK UPHOLSTERY

This Procedure includes the following:
Preparation for Removing/Installing Seat Frame (Standard Frame, Adjustable Frame, and Captains Van Seat) ..... Page 21
Replacing Exact Same Size Standard Seat Frame ..... Page 22
Removing/Installing Standard Seat Frame Sub-Assembly ..... Page 22
Changing Seat Depth ..... Page 23
Changing Seat Width (Standard and Adjustable Seat Frame) ..... Page 25
Installing/Removing Adjustable Seat Frame Sub-Assembly and/or Component Replacement ..... Page 26
Installing/Removing Captains Van Seat Assembly ..... Page 28
Replacing Captains Van Seat and/or Captains Van Seat Frame ..... Page 28
Converting From Standard Seat Frame to Adjustable Seat Frame or Vice Versa ..... Page 29
Converting From Adjustable Seat Frame to Captains Van Seat or Vice Versa ..... Page 29
Converting From Standard Seat Frame to Captains Van Seat or Vice Versa ..... Page 30
Removing/Installing Seat Pan ..... Page 30
Mounting Plate - Seat Angle Adjustment and Installation Orientation ..... Page 31

WARNING

After ANY adjustments, repair or service and BEFORE use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

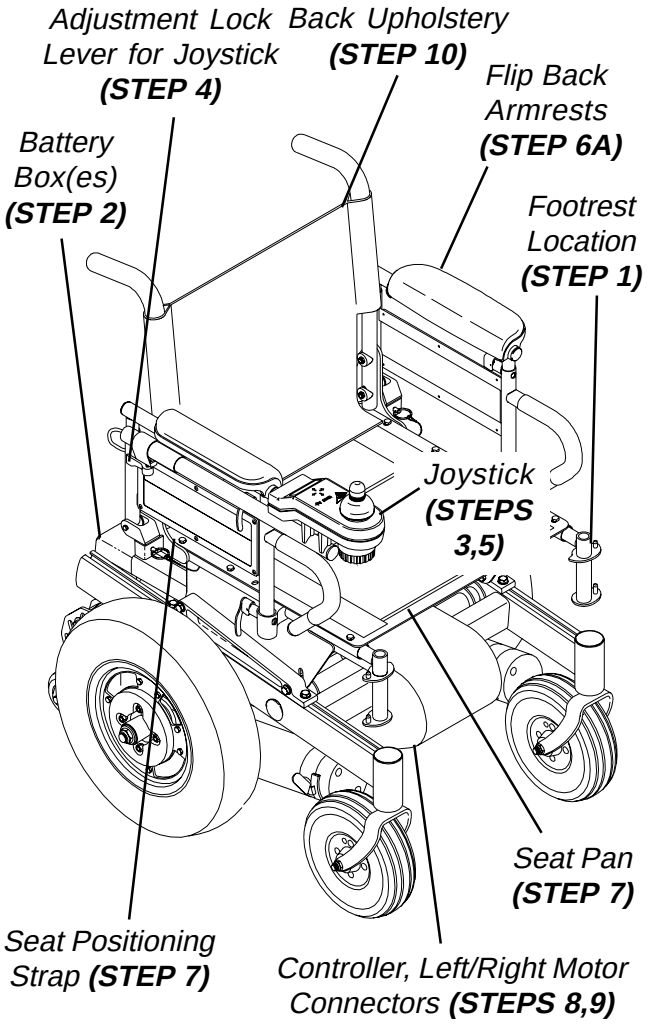
NOTE: The procedures in this section of the manual refer to NON-RECLINER seat frames only, EXCEPT Seat Angle Adjustment. For recliner seat frames, refer to PROCEDURE 14 of this manual.

PREPARATIONS FOR REMOVING/ INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) (FIGURE 1)

NOTE: When installing/replacing components of the wheelchair, refer to the individual procedure for correct use of LOCTITE 242 and torque specifications or PROCEDURE 3 of this manual.

NOTE: To reinstall these components, reverse the following steps.

1. Remove footrest assemblies. Refer to PROCEDURE 4 in of the owner's manual, 1081227.
2. Remove battery box(es). Refer to INSTALLING/REMOVING GROUP 24 BATTERY BOXES or INSTALLING/REMOVING 22NF BATTERY BOX in PROCEDURE 9 of this manual.


Adjustment Lock Lever for Joystick (STEP 4)
Back Upholstery (STEP 10)
Flip Back Armrests (STEP 6A)
Battery Box(es) (STEP 2)
Footrest Location (STEP 1)
Joystick (STEPS 3,5)
Seat Pan (STEP 7)
Seat Positioning Strap (STEP 7)
Controller, Left/Right Motor Connectors (STEPS 8,9)

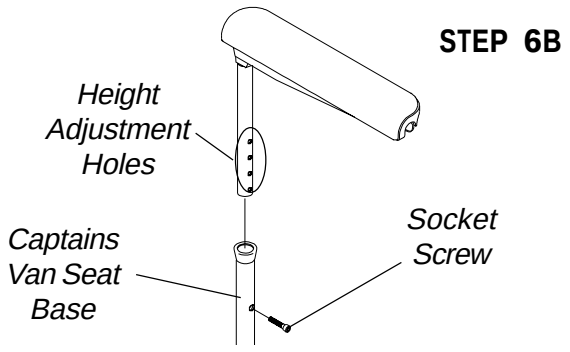


FIGURE 1 - PREPARATIONS FOR REMOVING/ INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT)

3. Cut tie wraps and disconnect joystick from controller.
4. Turn the lever on the adjustment lock to release the adjustment lock from the joystick mounting tube.
5. Remove the joystick from the wheelchair.
6. Perform one (1) of the following:
   A. **STANDARD OR ADJUSTABLE SEAT FRAMES** - Remove the flip-back armrests from the wheelchair. Refer to INSTALLING/REMOVING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, 1081227.
   B. **CAPTAINS VAN SEAT** - Remove the mounting screw that secures the armrest to the van seat frame. Repeat for opposite side.
7. For standard and adjustable seat frames, remove the seat pan (including seat positioning straps). Refer to REMOVING/INSTALLING SEAT PAN in this procedure of the manual.
8. Disconnect battery and left/right motor connectors from the controller. Refer to REPLACING WIRING HARNESS in PROCEDURE 10 of this manual.
9. Remove tie-wraps that secures the wiring harness to the seat frame and the charger cable from its mounting bracket. Refer to REPLACING WIRING HARNESS in PROCEDURE 10 of this manual.
10. For standard and adjustable seat frames, remove the back upholstery (including back canes and spreader bar, if applicable). Refer to REPLACING BACK UPHOLSTERY in PROCEDURE 5 of the manual.

REPLACING EXACT SAME SIZE STANDARD SEAT FRAME

1. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.
2. Remove the existing standard seat frame subassembly and install the NEW standard frame. Refer to REMOVING/INSTALLING STANDARD SEAT FRAME SUBASSEMBLY in this procedure of the manual.
3. **FOR 12-15-INCH SEAT DEPTHS ONLY:** Remove the CJ back brackets from the existing standard seat frame and install onto the NEW standard seat frame. Refer to REMOVING/INSTALLING CJ BACK BRACKETS FROM SEAT FRAME in this procedure of the manual.
4. Reinstall the components previously removed in STEP 1. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.

REMOVING/INSTALLING STANDARD SEAT FRAME SUBASSEMBLY (FIGURE 2)

Removing

1. Remove the four (4) mounting screws, locknuts and spacers, if applicable, that secure the standard seat frame subassembly to the seat mounting plates.
2. Remove the existing standard seat frame.

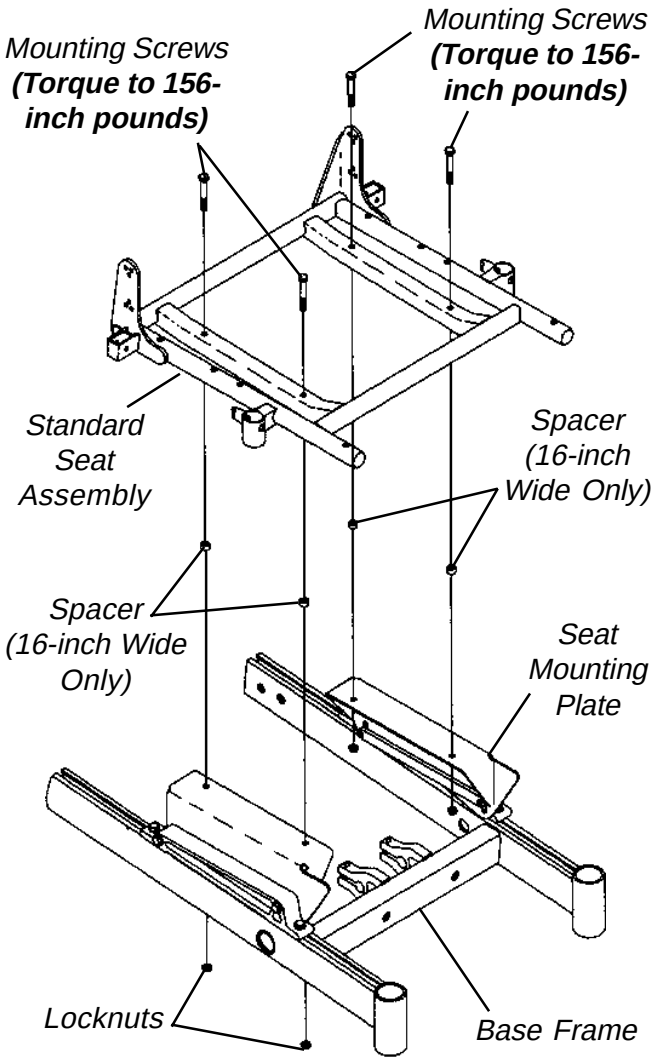


FIGURE 2 - REMOVING/INSTALLING STANDARD SEAT FRAME SUB-ASSEMBLY

Installing

1. Position NEW standard seat frame subassembly on seat mount plates.
2. Secure NEW standard seat frame subassembly onto seat mounting plates with the existing four (4) mounting screws, locknuts and spacers, if applicable. Torque to 156-inch pounds.

CHANGING SEAT DEPTH

Standard Seat Frame

NOTE: Review the chart below. This will determine the components needed to obtain the desired seat depth.

COMPONENT IDENTIFICATION TABLE FOR STANDARD SEAT FRAME

SEAT DEPTH	SEAT FRAME COMPONENTS		
	CJ BACK BRACKETS REQUIRED	SEAT PAN	SEAT FRAME DEPTH
12-inches to 15-inches	YES	17-inch	16-inch deep
16-inches	NO	16-inch	16-inch deep
17-inches	NO	17-inch	16-inch deep
18-inches	NO	18-inch	18-inch deep
19-inches	NO	19-inch	18-inch deep
20-inches	NO	20-inch	20-inch deep
21-inches	NO	21-inch	20-inch deep
22-inches	NO	22-inch	22-inch deep

1. Find current seat depth in left hand column in the chart.
2. Follow that row to right under seat frame components.
3. Verify and note the components of the current seat depth.
4. Repeat STEPS 1-3 for your desired seat depth.
5. Compare existing components of the current seat depth and the required components for the desired seat depth.
6. Perform one (1) of the following:
   A. If the current seat depth and the desired seat depth is within the 12-15-inch seat depth range, this change can be accomplished by repositioning the back canes on the CJ back brackets. Refer to CHANGING SEAT DEPTH BETWEEN 12-15-INCHES in this procedure of the manual.
   B. If the desired change only requires a **NEW** seat pan, refer to REMOVING/INSTALLING SEAT PAN in this procedure of the manual.
   C. For all other seat depth changes, perform the following:
      - PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.

      Perform one (1), two (2), or all three (3) of the procedures listed below depending on the components required for the desired seat depth determined from STEPS 1-5:

      - REMOVING/INSTALLING CJ BACK BRACKETS in this procedure of the manual.
      - REMOVING/INSTALLING STANDARD SEAT SUBASSEMBLY in this procedure of the manual.
      - REMOVING/INSTALLING SEAT PAN in this procedure of the manual.

      After completing the procedure(s) listed above, perform the steps outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) to complete the desired seat depth change.

Adjustable Seat Frame (FIGURE 3)

NOTE: Review the chart below. This will determine the components needed to obtain your desired seat depth.

COMPONENT IDENTIFICATION TABLE FOR STANDARD SEAT FRAME

SEAT DEPTH	SEAT FRAME COMPONENTS			
	CJ BACK BRACKETS REQUIRED	SEAT PAN	SIDE FRAME	CENTER FRAME
12-inches to 15-inches	YES	17-inch	Short	Short
16-inches	NO	16-inch	Short	Short
17-inches	NO	17-inch	Short	Short
18-inches	NO	18-inch	Medium	Short
19-inches	NO	19-inch	Medium	Short
20-inches	NO	20-inch	Long	Long
21-inches	NO	21-inch	Long	Long
22-inches	NO	22-inch	X-Long	Long

NOTE: Note the four (4) different lengths of side frames short, medium, long, and X-long, as well as the two different center frames, short and long. These components are interchanged to obtain the various different seat depths.

1. Find current seat depth in left hand column in the chart.
2. Follow that row to right under seat frame components.
3. Verify and note the components of the current seat depth.
4. Repeat STEPS 1-3 for the desired seat depth.
5. Compare existing components of the current seat depth and the required components for the desired seat depth.

To adjust the depth of the seat on the wheelchair, use the following guidelines:

If the current seat depth is and the desired seat depth are within the 12-15-inch seat depth range, this change can be accomplished by repositioning the back canes on the CJ back brackets. Refer to CHANGING SEAT DEPTH BETWEEN 12-15-INCHES in this procedure of the manual.

If the desired change only requires a **NEW** seat pan, refer to REMOVING/INSTALLING SEAT PAN in this procedure of the manual.

If the desired change requires the removal/installation of CJ back brackets, refer to REMOVING/INSTALLING CJ BACK BRACKETS in PROCEDURE 8 of this manual.

If the desired change requires a new side frame, and/or new center frame, perform the following steps:

A. Perform the instructions outlined in SEAT FRAME REMOVING/INSTALLING PREPARATIONS FOR STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT in this procedure of the manual.

NOTE: Note the mounting hole position of the side frame for proper installation of the NEW side frame.

B. Remove the two (2) mounting screws, coved washers, spacers, and locknuts that secure the side frame to the center frame.

C. Remove the side frame from the center frame.

D. Repeat STEPS A and B for opposite side frame.

If the desired seat depth requires a new center frame, determined in STEPS 1-5 perform STEPS E - G, otherwise proceed to STEP H.

E. Remove the four (4) mounting screws that secure the EXISTING center frame to support brackets.

F. Remove existing center frame from seat mount plates.

G. Secure **NEW** center frame to support brackets with the existing four (4) mounting screws and locknuts. Torque to 156-inch pounds.

H. Secure **NEW** side frame to the center frame at the position noted previously. Torque to 75-inch pounds.

*NOTE: If seat width adjustment is also desired, refer to **CHANGING SEAT WIDTH** in this procedure of the manual for mounting hole locations and allowable seat width/seat depth combinations.*

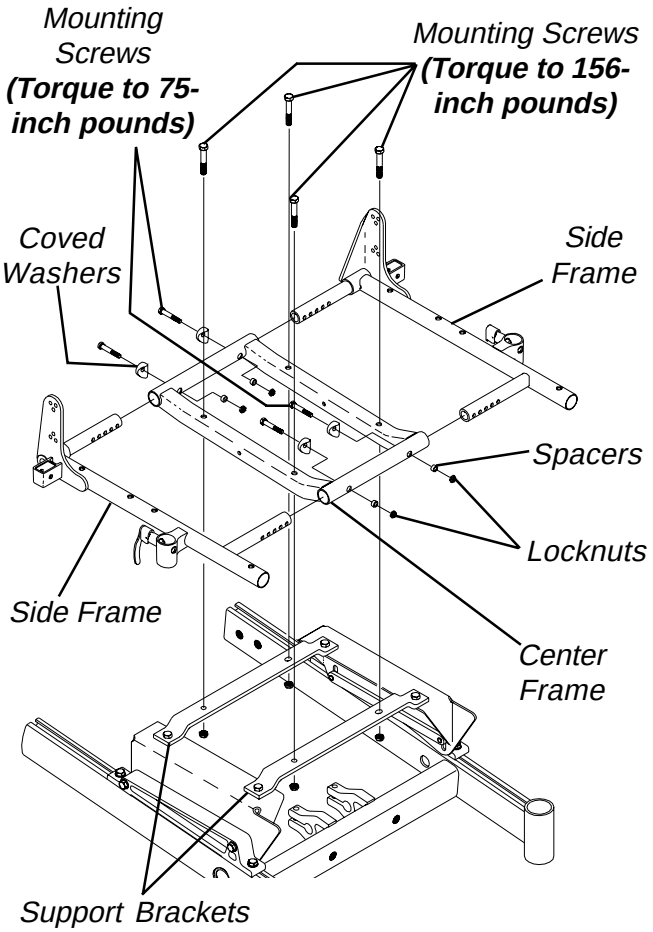


FIGURE 3- CHANGING SEAT DEPTH - ADJUSTABLE SEAT FRAME

Changing Seat Depth Between 12 and 15-Inches (FIGURE 4)

NOTE: There are two (2) sizes of CJ back brackets. Refer to the following chart to determine if the seat depth required is obtainable by repositioning the back canes only, or if the CJ back brackets must be replaced.

CJ BACK BRACKET (SEAT DEPTH) RANGES
12 and 13-inches OR 14 and 15-inches

If seat depth required is within seat depth range of the original CJ back brackets, only the back canes need to be repositioned. Refer to the following procedure.

If the seat depth required is NOT within the seat depth range of the original CJ back brackets, the CJ back brackets must be replaced before repositioning the back canes. Refer to REMOVING/INSTALLING CJ BACK BRACKETS in PROCEDURE 8 of this manual.

1. Remove the armrests from the wheelchair. Refer to INSTALLING/REMOVING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, 1081227.
2. Cut the tie wraps that secure the back upholstery to the CJ back brackets.
3. Pull the bottom of the back upholstery away from the rear of the seat pan.
4. Remove mounting screw, washer and coved washer from the top mounting hole of the CJ back bracket and back cane.

NOTE: Before removing the back canes from the CJ back brackets, note the BACK ANGLE for reinstallation.

NOTE: To avoid losing the insert in each back cane, line up the holes in the insert with the holes in the back cane and start one of the screws through the cane from the inside of the wheelchair to hold the insert in place.

5. Remove the mounting screw, washer and coved washer from the bottom mounting hole of the CJ back bracket and the back cane.
6. Reposition the back cane to the desired seat depth and angle. If changing the back angle as well, refer to BACK ANGLE ADJUSTMENT in PROCEDURE 8 of this manual.
7. Secure bottom of the back upholstery to the seat pan.
8. Secure the bottom of the back upholstery to the CJ back brackets with new tie wraps.
9. Use Loctite 242 and torque the mounting screws to 75-inch pounds.
10. Repeat the STEPS 1-9 for the opposite back cane.

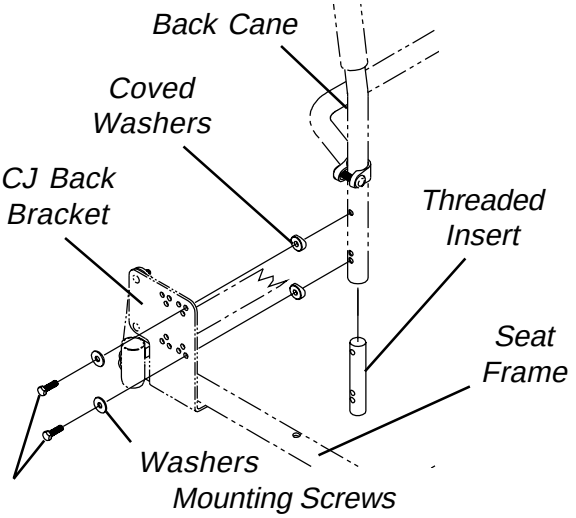


FIGURE 4 - ADJUSTING SEAT DEPTH - CHANGING SEAT DEPTH BETWEEN 12 AND 15-INCHES

11. Reinstall the armrests onto the wheelchair. Refer to INSTALLING/REMOVING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, 1081227.

CHANGING SEAT WIDTH (STANDARD AND ADJUSTABLE SEAT FRAME)

Standard Seat Frame

NOTE: If changing seat width below 16-inches wide, you must convert to an adjustable seat frame. Refer to CONVERTING FROM STANDARD TO ADJUSTABLE SEAT FRAME OR VICE VERSA in this procedure of the manual. For all changes above 16-inches wide, perform the outlined steps.

1. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.
2. Remove the existing standard seat frame subassembly and install the NEW standard frame. Refer to REMOVING/INSTALLING STANDARD SEAT FRAME SUBASSEMBLY in this procedure of the manual.
3. **FOR 12-15-INCH SEAT DEPTHS ONLY:** Remove the CJ back brackets from the existing standard seat frame and install onto the NEW standard seat frame. Refer to REMOVING/INSTALLING CJ BACK BRACKETS in PROCEDURE 8 of this manual.
4. Reinstall the components previously removed in STEP 1. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.

Adjustable Seat Frame (FIGURE 5)

NOTE: If changing seat width above 16-inches wide, you must convert to a standard seat frame. Refer to CONVERTING FROM STANDARD TO ADJUSTABLE SEAT FRAME OR VICE VERSA in this procedure of the manual. For all changes below 16-inches wide, perform the outlined steps.

1. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.
2. Review the following chart for the allowable seat width and seat depth combinations for the adjustable seat frame.

ALLOWABLE SEAT WIDTH AND DEPTH COMBINATIONS FOR ADJUSTABLE SEAT FRAME

SEAT DEPTH	SEAT WIDTH 12	13	14	15	16
12	✓	✓	✓	✓	✓
13	✓	✓	✓	✓	✓
14	✓	✓	✓	✓	✓
15	✓	✓	✓	✓	✓
16	✓	✓	✓	✓	✓
17	N/A	N/A	✓	✓	✓
18	N/A	N/A	✓	✓	✓
19	N/A	N/A	✓	✓	✓
20	N/A	N/A	✓	✓	✓
21	N/A	N/A	✓	✓	✓
22	N/A	N/A	✓	✓	✓

NOTE: The seat widths and seat depths enclosed in the outlined box will require the use of CJ back brackets and a 17-inch deep seat pan.

3. Remove the two (2) mounting screws, coved washers, spacers, and locknuts that secure the side frame to the center frame.
4. Adjust side frame to desired width determined from STEP 2. See DETAIL "A" for proper mounting hole position.
5. Secure side frame to center frame with existing mounting screws, coved washers, spacers, and locknuts. Torque mounting screws to 75-inch pounds.

WARNING

Both side frames MUST be adjusted to the same mounting hole position to maintain proper weight balance of user and seat frame. If weight is not balanced, injury to the assistant and/or user and damage to the wheelchair may result.

6. Repeat STEPS 3-5 for opposite side frame.
7. Perform one (1) of the following:
   A. For adjusting the seat width only, perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.

      NOTE: When performing the steps outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) the seat pan, seat cushion, back upholstery and spreader bar (if applicable), will need to be replaced. Spreader bars are only required on seat depths greater than 19-inches.

   B. For all other changes regarding seat frame changes, refer back to the starting procedure to complete the desired change.

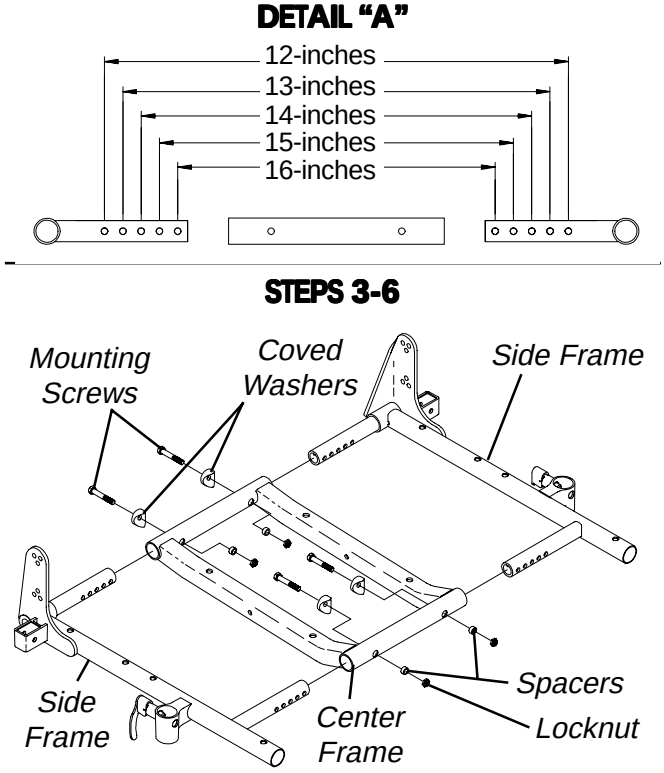


FIGURE 5 -CHANGING SEAT WIDTH - ADJUSTABLE SEAT FRAME

INSTALLING/REMOVING ADJUSTABLE SEAT FRAME SUBASSEMBLY AND/OR COMPONENT REPLACEMENT (FIGURE 6)

Converting from Adjustable Seat Frame to Standard Seat Frame or Captains Van Seat

NOTE: This section must be performed in conjunction with a starting procedure.

1. Remove the four (4) mounting screws that secure the two (2) support brackets of the adjustable seat frame subassembly to the seat mounting plates.
2. To complete conversion, refer back to the starting procedure to complete the desired change.

Converting from Standard Seat Frame or Captains Van Seat To Adjustable Seat Frame

NOTE: This section must be performed in conjunction with a starting procedure.

NOTE: When converting the seat frame, you will need a seat pan, seat cushion, back upholstery and spreader bar (if applicable). Spreader bars are only required on seat depths of greater than 19-inches.

1. Secure both support brackets to the seat mounting plates with four (4) mounting screws and locknuts. Torque mounting screws to 156-inch pounds.
2. Secure the center frame to the support brackets with four (4) mounting screws, locknuts, and spacers. Torque to 156-inch pounds.
3. Insert the side frame into the center frame and secure with mounting screw, coved spacer, spacer, and locknut. Torque to 75-inch pounds. Repeat for opposite side frame.

Component Replacement

1. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.

NOTE: Note the mounting hole position of the current side frame(s) for proper installation of the NEW side frame(s).

2. Remove the two (2) mounting screws, coved spacers, spacers, and locknuts that secure the side frame to the center frame.

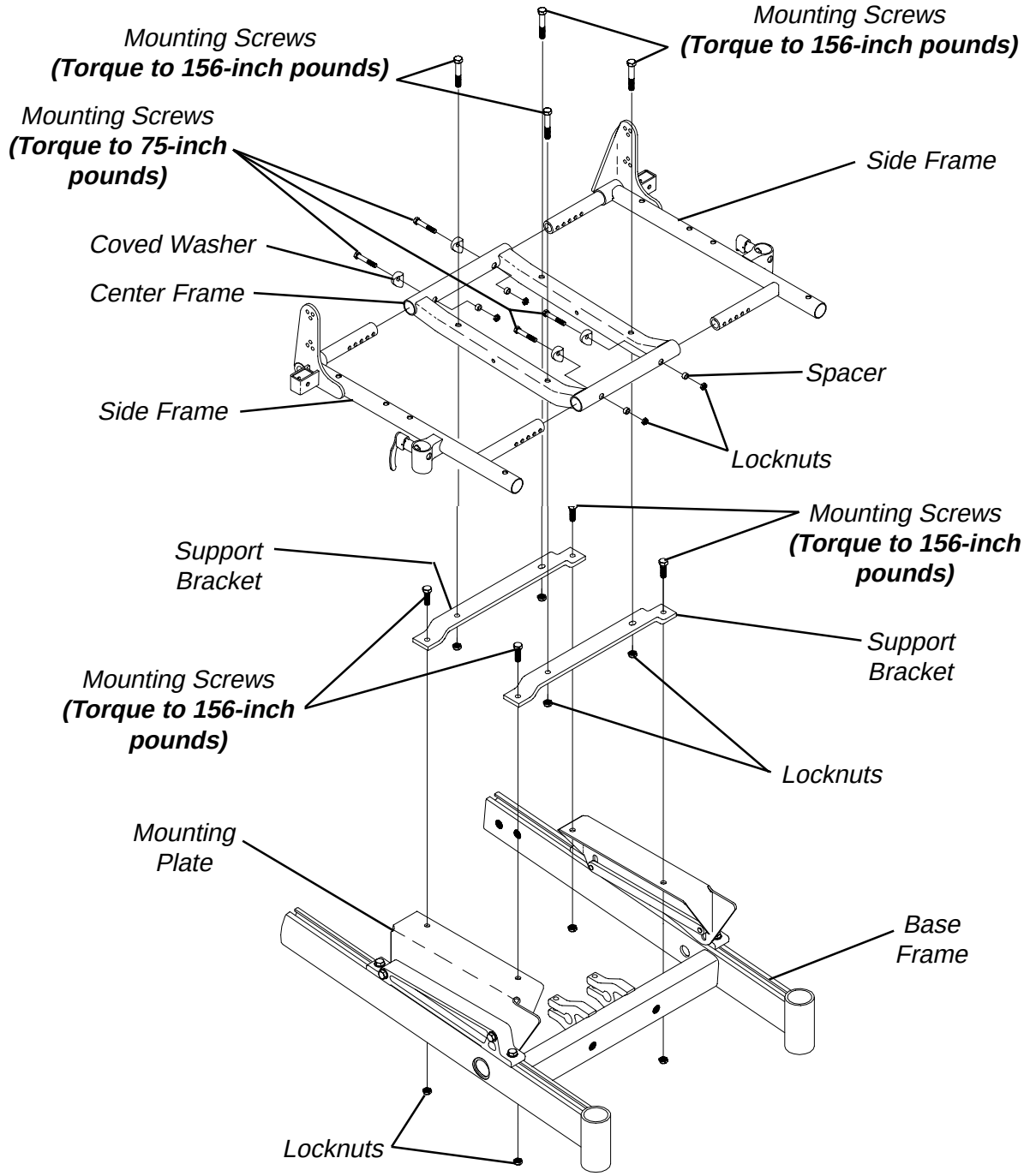


FIGURE 6 - INSTALLING/REMOVING ADJUSTABLE SEAT FRAME SUBASSEMBLY AND/OR COMPONENT REPLACEMENT

3. Perform one (1) of the following:
   A. If center frame needs replaced, repeat STEP 2 for opposite side frame and proceed to STEP 4.
   B. If opposite side frame needs replaced, repeat STEP 2, then proceed to STEP 6. Otherwise proceed to STEP 6.
4. Remove the four (4) mounting screws and locknuts that secure the center frame to the support brackets.
5. Secure NEW center frame to support brackets with existing four (4) mounting screws and locknuts. Torque to 156-inch pounds.

WARNING

Both side frames MUST be adjusted to the same mounting hole position to maintain proper weight balance of user and seat frame. If weight is not balanced, injury to the assistant and/or user and damage to the wheelchair may result.

6. Install new/existing side frame(s) into new/existing center frame at the mounting position previously noted. Torque to 75-inch pounds.
7. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.

INSTALLING/REMOVING CAPTAINS VAN SEAT ASSEMBLY (FIGURE 7)

Installing Captains Van Seat

1. Position the captains van seat on the seat mounting plates at the position shown in FIGURE 7.
2. Line up mounting holes in the captains van seat frame and the mounting holes in the seat mounting plates.
3. Secure the captains van seat to the seat mounting plates with four (4) mounting screws, and locknuts. Torque to 156-inch pounds.

Removing Captains Van Seat

1. Remove the four (4) mounting screws and locknuts that secure the captains van seat to the seat mounting plates.
2. Remove captains van seat from seat mounting plates.

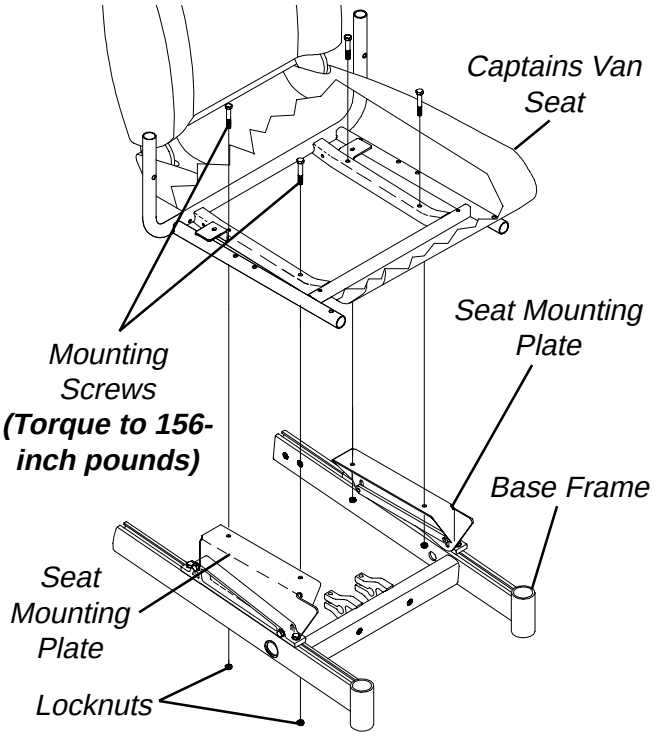


FIGURE 7 - REMOVING/INSTALLING CAPTAINS VAN SEAT ASSEMBLY

REPLACING CAPTAINS VAN SEAT AND/OR CAPTAINS VAN SEAT FRAME (FIGURE 8)

1. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.
2. Remove the captains van seat assembly from the wheelchair. Refer to INSTALLING /REMOVING CAPTAINS VAN SEAT ASSEMBLY in this procedure of the manual.

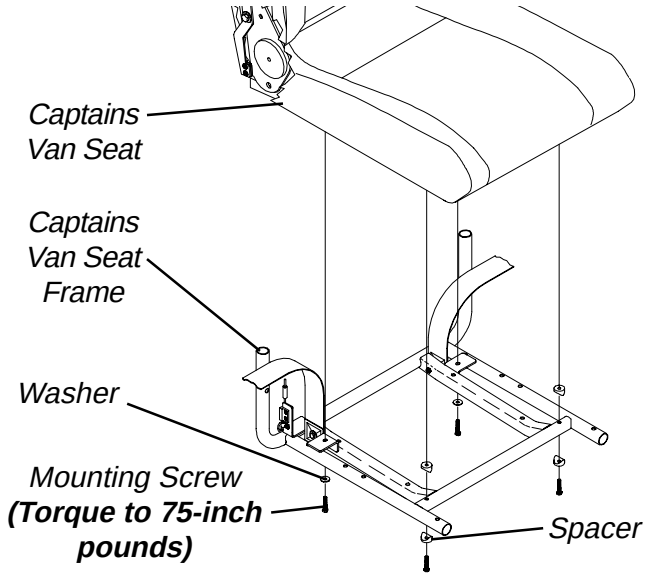


FIGURE 8 - REPLACING CAPTAINS VAN SEAT AND/OR CAPTAINS VAN SEAT FRAME

3. Remove the four (4) mounting screws, two (2) washers, and two (2) spacers that secure the captains van seat to the seat frame.
4. Replace the captains van seat or the seat frame.
5. Secure new/existing captains van seat to the new/existing captains van seat frame with existing four (4) mounting screws and spacers. Torque to 75- inch pounds.
6. Install new captains van seat assembly onto the wheelchair. Refer to INSTALLING/REMOVING CAPTAINS VAN SEAT ASSEMBLY in this procedure of the manual.
7. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.

CONVERTING FROM STANDARD SEAT FRAME TO ADJUSTABLE SEAT FRAME OR VICE VERSA

1. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.
2. Perform one (1) of the following:
   A. Remove the existing standard seat frame subassembly. Refer to REMOVING/INSTALLING STANDARD SEAT FRAME SUBASSEMBLY in this procedure of the manual.
   B. Remove the adjustable seat frame subassembly. Refer to REMOVING/INSTALLING ADJUSTABLE SEAT FRAME SUBASSEMBLY AND/OR COMPONENT REPLACEMENT in this procedure of the manual.
3. Perform one (1) of the following:
   A. Install the standard frame subassembly. Refer to INSTALLING/REMOVING STANDARD SEAT FRAME SUBASSEMBLY in this procedure of the manual.
   B. Install the adjustable seat frame subassembly. Refer to INSTALLING/REMOVING ADJUSTABLE SEAT FRAME SUBASSEMBLY AND/OR COMPONENT REPLACEMENT in this procedure of the manual.
4. **ADJUSTABLE FRAMES ONLY:** Adjust side frame to desired seat width. Refer to CHANGING SEAT WIDTH in this procedure of the manual for mounting hole locations and allowable seat width/seat depth combinations.
5. **STANDARD AND ADJUSTABLE FRAME WITH 12-15-INCH SEAT DEPTHS ONLY:** Remove the CJ back brackets from the existing standard seat frame and install onto the **NEW** standard seat frame. Refer to REMOVING/INSTALLING CJ BACK BRACKETS in PROCEDURE 8 of this manual.
6. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.

CONVERTING FROM ADJUSTABLE SEAT FRAME TO CAPTAINS VAN SEAT OR VICE VERSA

1. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.
2. Perform one (1) of the following:
   A. Remove the adjustable seat frame subassembly. Refer to REMOVING/INSTALLING STANDARD SEAT FRAME SUBASSEMBLY in this procedure of the manual.
   B. Remove the captains van seat Assembly. Refer to INSTALLING/REMOVING CAPTAINS VAN SEAT ASSEMBLY in this procedure of the manual.
3. Perform one (1) of the following sections:

Adjustable Frames

   A. Install the adjustable seat frame subassembly. Refer to INSTALLING/REMOVING ADJUSTABLE SEAT FRAME SUBASSEMBLY AND/OR COMPONENT REPLACEMENT in this procedure of the manual.
   B. Adjust side frames to desired seat width. Refer to CHANGING SEAT WIDTH in this procedure of the manual for mounting hole locations and allowable seat width/seat depth combinations.
   C. **12-15-INCH SEAT DEPTHS ONLY:** Install the CJ back brackets, seat positioning strap, and quick release pin from the onto the adjustable seat frame. Refer to REMOVING/INSTALLING CJ BACK BRACKETS in PROCEDURE 8 of this manual.
   D. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.

Captains Van Seat

   A. Install the captains van seat. Refer to INSTALLING/REMOVING CAPTAINS VAN SEAT ASSEMBLY in this procedure of the manual.
   B. Adjust the captains van seat to the desired position. Refer to ADJUSTING CAPTAINS VAN SEAT in this procedure of the manual.

C. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.

CONVERTING FROM STANDARD SEAT FRAME TO CAPTAINS VAN SEAT OR VICE VERSA

1. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.
2. Perform one (1) of the following:
   A. Remove the standard seat frame subassembly. Refer to REMOVING/INSTALLING STANDARD SEAT FRAME SUBASSEMBLY in this procedure of the manual.
   B. Remove the captains van seat Assembly. Refer to INSTALLING/REMOVING CAPTAINS VAN SEAT ASSEMBLY in this procedure of the manual.
3. Perform one (1) of the following:
   A. Install the captains van seat. Refer to INSTALLING/REMOVING CAPTAINS VAN SEAT ASSEMBLY in this procedure of the manual.
   B. Install the standard seat frame. Refer to REMOVING/INSTALLING STANDARD SEAT FRAME SUBASSEMBLY in this procedure of the manual.
4. **STANDARD FRAMES ONLY ON 12-15-INCH SEAT DEPTHS ONLY:** Install the CJ back brackets from the onto the adjustable seat frame. Refer to REMOVING/INSTALLING CJ BACK BRACKETS in PROCEDURE 8 of this manual.
5. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in this procedure of the manual.
6. Adjust the captains van seat to the desired position. Refer to ADJUSTING CAPTAINS VAN SEAT in this procedure of the manual.

REMOVING/INSTALLING SEAT PAN (FIGURE 9)

Removing

1. Remove the seat cushion from the seat pan.
2. Remove the flip-back armrests from the wheelchair. Refer to INSTALLING/REMOVING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, 1081227.
3. Remove the six (6) mounting screws, locknuts, and spacers that secure the seat pan, seat positioning strap, and quick release pin to the seat frame.

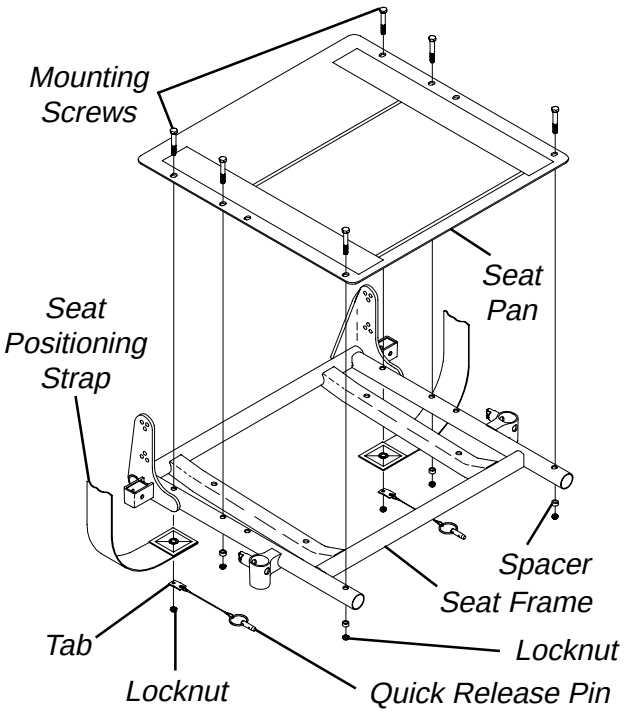
NOTE: When removing seat pan, note tab position of quick release pin to the seat positioning strap.

Installing

1. Position the NEW seat pan on the seat frame, aligning the mounting holes of the seat pan and the mounting holes of the seat frame.
2. Position the seat positioning strap and quick release pin tab onto the seat frame and secure with mounting screw and locknut. See FIGURE 9 for proper orientation. Repeat for other seat positioning strap.

NOTE: Check seat positioning strap for proper length. The width range for the four (4) seat positioning straps are: 12-16-inches wide (Junior), 16-19-inches wide, 20-22-inches wide, and 23-24-inches wide.

3. Reinstall the remaining mounting screws, locknuts, and spacers. Torque all mounting screws to 75-inch pounds.
4. Remove the protective strips from new seat pan and reinstall the seat cushion onto the seat pan.
5. Perform one (1) of the following:
   A. When changing the seat width or depth, refer back to that procedure to complete the desired change.



NOTE: Illustration shows standard frame only for clarity. The seat pan removes/installs onto the adjustable seat frame the way.

FIGURE 9 - REMOVING/INSTALLING SEAT PAN

B. Reinstall the flip-back armrests from the wheelchair. Refer to INSTALLING/REMOVING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, 1081227.

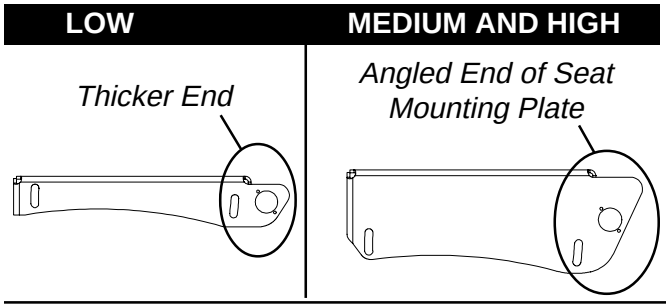
MOUNTING PLATE - SEAT ANGLE ADJUSTMENT AND INSTALLATION ORIENTATION (FIGURE 10)

Seat Angle Adjustment

NOTE: The angle of the seat is factory set providing the user with a 5° seat dump. This angle can changed by adjusting either the front or back of the seat mount plate to obtain any angle between 0° or 10° seat dump.

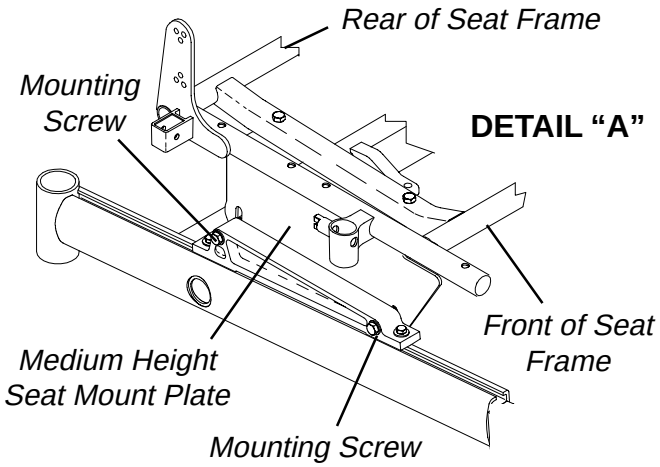
NOTE: There are three (3) heights of seat mounting plates; low, medium, and high. See chart below for proper settings.

1. To obtain a 0° seat dump (DETAIL "A"):
   A. Loosen the two (2) mounting screws that secure the rear of the seat frame to the seat mount plate.
   B. Position the mounting screws at the bottom of the rear slot.
   C. Securely tighten both mounting screws. Torque to 15-in/lbs.
2. To obtain a 10° seat dump (DETAIL "A"):
   A. Loosen the two (2) mounting screws that secure the front of the seat frame to the seat mount plate.
   B. Position the mounting screws at the bottom of the front slot.
   C. Securely tighten both mounting screws. Torque to 156-in/lbs.



Installation Orientation

1. **Medium and High Seat Mounting Plates:** Install with the angled end toward the front of the wheelchair.
2. **Low Seat Mounting Plates:** Install with the thicker end toward the front of the wheelchair.



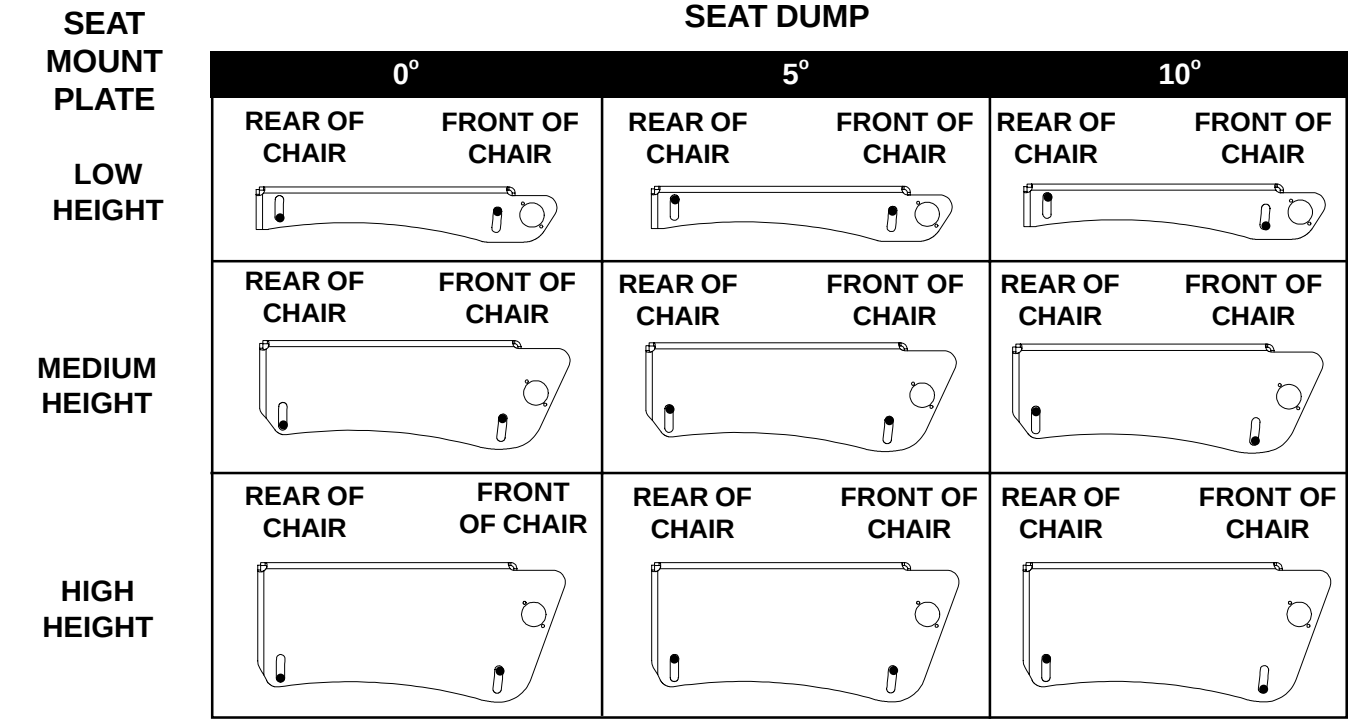


FIGURE 10 - MOUNTING PLATE - SEAT ANGLE ADJUSTMENT AND INSTALLATION ORIENTATION

This Procedure Includes the Following:
Replacing Seat Mounting Plates
Replacing Seat Support Brackets
Replacing Seat Support Bracket T-Nuts
Replacing Battery Charger Bracket and T-Nut
Removing/Installing Seat Stop Screws

WARNING

After ANY adjustments, repair or service and BEFORE use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

REPLACING SEAT MOUNTING PLATES (FIGURE 1)

NOTE: When replacing components of the wheelchair, refer to the individual procedure for correct use of LOCTITE 242 and torque specifications or PROCEDURE 3 of this Manual.

1. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in PROCEDURE 6 of this manual.
2. Perform one (1) of the following:
   A. Remove standard seat frame subassembly. Refer to REMOVING/INSTALLING STANDARD SEAT FRAME SUBASSEMBLY in PROCEDURE 6 of this manual.
   B. Remove adjustable seat frame subassembly. Refer to INSTALLING/REMOVING ADJUSTABLE SEAT FRAME ASSEMBLY AND OR COMPONENT REPLACEMENT in PROCEDURE 6 of this manual.
   C. Remove captains van seat. Refer to INSTALLING/REMOVING CAPTAINS VAN SEAT ASSEMBLY in PROCEDURE 6 of this manual.

NOTE: Before removing seat mounting plates, note the position of the washers.

3. Remove the two (2) mounting screws, washers and bolt strap bracket that secure the seat mounting plate to the seat support bracket.
4. Secure NEW seat mounting plate with existing two (2) mounting screws, washers, and bolt straps to seat support bracket using Loctite 242 and torque to 156-inch pounds.
5. Repeat STEPS 1-2 for opposite side, if necessary.

NOTE: For illustrations of the three (3) different seat mounting plates, refer to MOUNTING PLATE - SEAT ANGLE ADJUSTMENT AND INSTALLATION ORIENTATION in PROCEDURE 6 of this manual.

6. Adjust seat mounting plates to desired angle. Refer to MOUNTING PLATE - SEAT ANGLE ADJUSTMENT AND INSTALLATION ORIENTATION in PROCEDURE 6 of this manual.
7. Reverse STEP 2A, 2B or 2C.
8. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in PROCEDURE 6 of this manual.

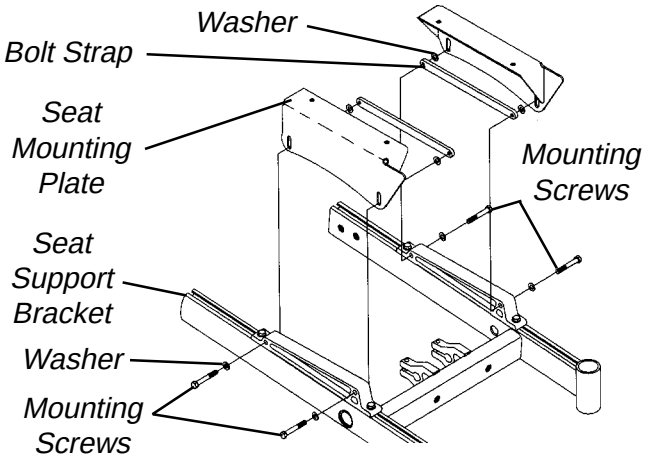


FIGURE 1 - REPLACING SEAT MOUNTING PLATES

REPLACING SEAT SUPPORT BRACKETS (FIGURE 2)

1. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in PROCEDURE 6 of this manual.
2. Perform one (1) of the following:
   A. Remove standard seat frame subassembly. Refer to REMOVING/INSTALLING STANDARD SEAT FRAME SUBASSEMBLY in PROCEDURE 6 of this manual.
   B. Remove adjustable seat frame subassembly. Refer to INSTALLING/REMOVING ADJUSTABLE SEAT FRAME ASSEMBLY AND OR COMPONENT REPLACEMENT in PROCEDURE 6 of this manual.
   C. Remove captains van seat. Refer to INSTALLING/REMOVING CAPTAINS VAN SEAT ASSEMBLY in PROCEDURE 6 of this manual.
3. Remove seat mount plates. Refer to REPLACING SEAT MOUNTING PLATES in this procedure of the manual.

NOTE: Note the position of the seat support brackets before removing to ensure proper reinstallation.

WARNING

Do not adjust the position of the seat support bracket in this procedure. If an adjustment is desired, refer to ADJUSTING WEIGHT DISTRIBUTION in PROCEDURE 16 of this manual.

4. Remove the two (2) mounting screws and washers that secure the seat support bracket to the base frame.

WARNING

When installing seat support bracket, ensure the mounting screws are threaded into the T-Nuts located inside the channel of the base frame.

5. Secure the NEW seat support bracket to base frame with the existing two (2) mounting screws and washers. Torque to 156-inch pounds.
6. Reinstall seat mount plates. Refer to REPLACING SEAT MOUNTING PLATES in this procedure of the manual.
7. Adjust seat mount plates to desired angle. Refer to MOUNTING PLATE - SEAT ANGLE ADJUSTMENT AND INSTALLATION ORIENTATION in PROCEDURE 6 of this manual.
8. Reverse STEP 2A, 2B or 2C.
9. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in PROCEDURE 6 of this manual.

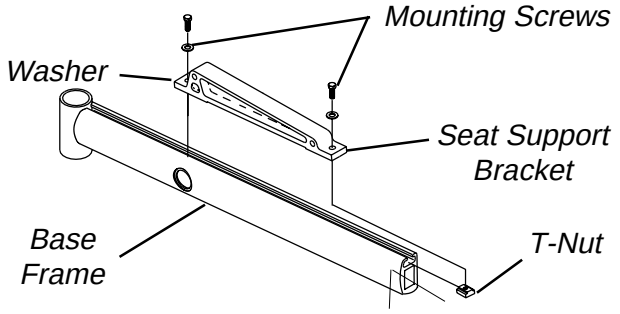


FIGURE 2 - REPLACING SEAT SUPPORT BRACKETS

REPLACING SEAT SUPPORT BRACKET T-NUTS (FIGURE 3)

1. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in PROCEDURE 6 of this manual.
2. Perform one (1) of the following:
   A. Remove standard seat frame subassembly. Refer to REMOVING/INSTALLING STANDARD SEAT FRAME SUBASSEMBLY in PROCEDURE 6 of this manual.
   B. Remove adjustable seat frame subassembly. Refer to INSTALLING/REMOVING ADJUSTABLE SEAT FRAME ASSEMBLY AND OR COMPONENT REPLACEMENT in PROCEDURE 6 of this manual.
   C. Remove captains van seat. Refer to INSTALLING/REMOVING CAPTAINS VAN SEAT ASSEMBLY in PROCEDURE 6 of this manual.
3. Remove the seat mount plates. Refer to REPLACING SEAT MOUNTING PLATES in this procedure of the manual.

NOTE: Before removing seat mounting plates, note the position of the washers.

4. Remove the seat support brackets. Refer to REPLACING SEAT SUPPORT BRACKETS in this procedure of the manual.
5. Remove the seat stop screw that is closest to the end cap. Refer to REMOVING/INSTALLING SEAT STOP SCREWS in this procedure of the manual.
6. Remove the end cap and channel cover.
7. Slide existing T-Nut(s) out of channel.
8. Insert NEW T-Nut(s) into channel in correct orientation.
9. Replace channel cover and end cap.

WARNING

The seat stop screws must be in place before operation of your power wheelchair. Ensure the T-Nut(s) are positioned between both seat stop screws.

10. Use Loctite 242 and reinstall seat stop screw into base frame.
11. Reinstall the seat seat support brackets. Refer to REPLACING SEAT SUPPORT BRACKETS in this procedure of the manual.

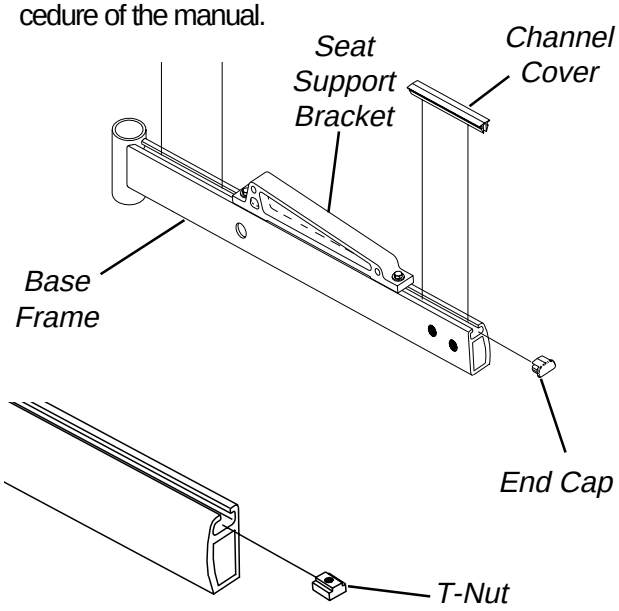


FIGURE 3 - REPLACING SEAT SUPPORT BRACKET T-NUTS

12. Reinstall the seat mount plates. Refer to REPLACING SEAT MOUNTING PLATES in this procedure of the manual.
13. Adjust seat mounting plates to desired angle. Refer to MOUNTING PLATE - SEAT ANGLE ADJUSTMENT AND INSTALLATION ORIENTATION in PROCEDURE 6 of this manual.
14. Reverse STEP 2A, 2B or 2C.
15. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in PROCEDURE 6 of this manual.

REPLACING BATTERY CHARGER BRACKET AND T-NUT (FIGURE 4)

NOTE: For 3G wheelchairs equipped with 2G powered seating systems only.

1. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING THE SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in PROCEDURE 6 of this manual.
2. Remove one (1) of the following: (Refer to Procedure 6)
   A. Standard seat frame subassembly.
   B. Adjustable seat frame subassembly.
   C. Captains van seat.
3. Remove the seat support brackets. Refer to REPLACING SEAT SUPPORT BRACKETS in this procedure of this manual.
4. Remove the two (2) mounting screws that secure the battery charger connector to the mount bracket.
5. Remove battery charger connector from mount bracket.
6. Remove the mounting screw which secures the battery charger mount bracket to the T-nut located in the channel of the base frame.
7. Replace battery charger mount bracket and secure to base frame with existing mounting screw.

NOTE: To replace the Battery Charger Bracket T-Nut, perform STEPS 3-13 in REPLACING SEAT SUPPORT BRACKET T-NUTS in this procedure of the manual.

8. Secure the battery charger connector to the mount bracket with the EXISTING two (2) mounting screws. Tighten securely.
9. Reverse STEP 2A, 2B or 2C.
10. Perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in PROCEDURE 6 of this manual.

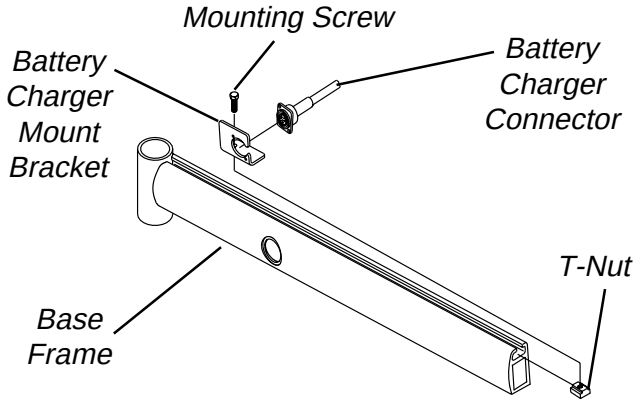


FIGURE 4 - REPLACING BATTERY CHARGER BRACKET AND T-NUT

REMOVING/INSTALLING SEAT STOP SCREWS (FIGURE 5)

NOTE: The front seat stop screw should only be removed if replacing a T-nut for either the seat support bracket or the battery charger mount bracket. The rear seat stop screw should never be removed.

1. Unthread seat stop screw from base frame.

WARNING

The seat stop screws must be in place before operation of your power wheelchair. Ensure the seat support bracket is positioned between both seat stop screws.

2. When reinstalling the front seat stop screw, ensure the seat support bracket is located in-between both seat stop screws. Use loctite 242 and tighten securely.

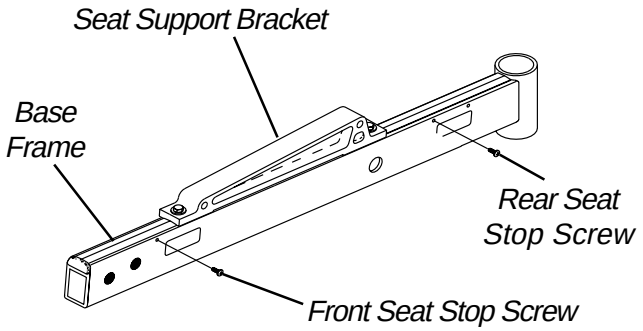


FIGURE 5 - REMOVING/INSTALLING SEAT STOP SCREWS

This Procedure includes the following:

Removing/Installing CJ Back Brackets

Changing Back Height

Back Angle Adjustment

WARNING

After ANY adjustments, repair or service and BEFORE use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

NOTE: The procedures in this section of the manual refer to NON-RECLINER seat frames only. For recliner seat frames, refer to ***PROCEDURE 14*** *of this manual.*

REMOVING/INSTALLING CJ BACK BRACKETS (FIGURE 1)

NOTE: The following procedure is for Jr. wheelchairs only.

Removing CJ Back Brackets

1. If necessary, perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in PROCEDURE 6 of this manual.
2. Remove the locknuts and washers that secure the CJ back bracket to the back angle plate.
3. Remove the mounting screw and locknut that secures the quick release pin and CJ back bracket and seat positioning strap to the seat frame.
4. Remove the existing CJ back bracket.
5. Repeat STEPS 2-4 for the opposite CJ back bracket.
6. For replacement of CJ back brackets, proceed to REMOVING/INSTALLING CJ BACK BRACKETS in this procedure of the manual.

Installing CJ Back Brackets

1. If necessary, perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in PROCEDURE 6 of this manual.
2. Install the threaded studs of the CJ back bracket through the back angle plates as shown in FIGURE 1.

NOTE: Ensure the CJ back bracket is mounted in the front holes of the back angle plates as shown in DETAIL "A".

WARNING

Always wear your seat positioning strap.

3. Position the seat positioning strap and quick release pin under the CJ back bracket.
4. Secure the quick release pin, seat positioning strap, and CJ back bracket to the seat frame. Torque to 75-inch pounds.
5. Install washers and locknuts onto the threaded studs of the CJ back bracket. Torque to 75-inch pounds.
6. For replacing CJ back brackets only, perform the instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in PROCEDURE 6 of this manual.

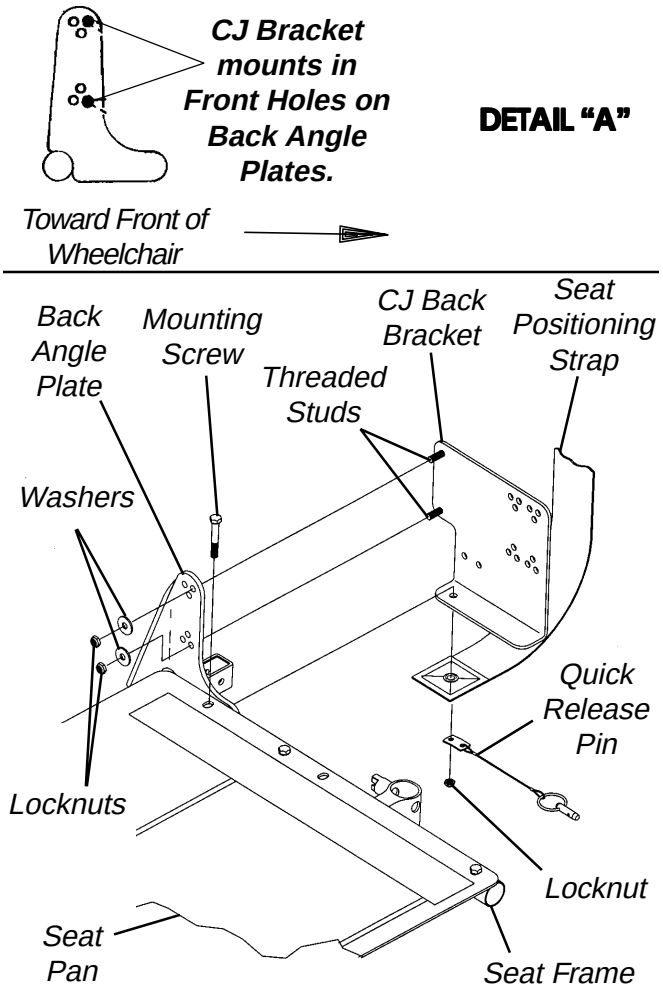


FIGURE 1 - REMOVING/INSTALLING CJ BACK BRACKETS

CHANGING BACK HEIGHT (FIGURE 2)

NOTE: If changing the back height, new back upholstery may be needed as well. Refer to the following chart to determine if new back upholstery is needed:

BACK UPHOLSTERY HEIGHT RANGES
16-17-INCHES
18-19-INCHES
20-INCHES
21-22-INCHES
23-24-INCHES

If back height required is within the range of the original back height, only new back canes will be needed.

If the back height required is NOT within the range of the original back height, new back upholstery, as well as new back canes will be needed.

NOTE: Existing hardware and inserts will be reused.

1. Remove the armrests from the wheelchair. Refer to INSTALLING/REMOVING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, 1081227.

NOTE: Note the correct mounting screw mounting positions to ensure the proper back angle for reinstallation.

2. Remove the two (2) mounting screws and washers that secure the existing back upholstery to the back canes.
3. Remove the four (4) mounting screws, washers, spacers, and locknuts that secure the existing back canes to the seat frame.
4. Remove the inserts from the existing back canes.
5. Remove the back assembly from the wheelchair.
6. If applicable, loosen, but do not remove the mounting screws and locknuts that secure the spreader bar to the existing back canes.
7. Remove existing back canes from the back assembly.
8. Slide the inserts into the bottom of the **NEW** back canes.
9. Line up the mounting holes of the inserts with the mounting holes in the back canes.

NOTE: To keep the inserts lined up for reinstallation onto the wheelchair, start one (1) of the mounting screws through the back cane from inside of the wheelchair to hold the insert in place.

10. Slide the **NEW** back canes through the existing/**NEW** back upholstery and spreader bar.
11. If applicable, loosely tighten the mounting screws that secure the spreader bar to the **NEW** back canes.
12. Line up the mounting holes in the back canes with the mounting holes in the seat frame.

NOTE: If needing a reference for proper mounting holes for the back angle required, or if changing the original back angle, refer to BACK ANGLE ADJUSTMENT in this procedure of the manual.

WARNING

The back canes MUST be fastened securely to the seat frame BEFORE using the wheelchair. Torque to 75-inch pounds.

13. Secure the two (2) **NEW** back canes to the seat frame with the existing four (4) mounting screws, washers, spacers, and locknuts. Use Loctite 242 and torque to 75-inch pounds.
14. Secure the top of the existing/new back upholstery to the back canes with the two (2) existing mounting screws and washers.
15. Secure bottom of the existing/**NEW** back upholstery to rear of the seat pan.
16. Secure the bottom of the existing/**NEW** back upholstery to the back canes with new tie-wraps.

NOTE: Clean upholstery with warm DAMP cloth and mild detergent to remove superficial soil.

WARNING

Laundering or moisture will reduce flame retardancy of the upholstery.

NOTE: When replacing the back upholstery, back assembly or changing back height, follow these guidelines for spreader bar height (where applicable):

BACK HEIGHT	◆ SPREADER BAR HEIGHT
16-inches*	5-inches
17-inches*	5-inches
18-19-inches*	7-inches
20-24inches	7-inches

*NOTE: Spreader Bar required on back heights 20-24-inches. *Spreader bar ONLY required on these back heights if the width or depth of the chair exceeds 19-inches.*

◆ Height of Spreader Bar from Bottom of Back Canes to Top of Spreader Bar Clamp.

HEAVY DUTY MODELS

NOTE: Spreader bar required on all Heavy Duty models.

BACK HEIGHT	◆ SPREADER BAR HEIGHT
16-17-inches	5-inches
18-24-inches	7-inches

◆Height of Spreader Bar from Bottom of Back Canes to Top of Spreader Bar Clamp.

17. If necessary, reposition the spreader bar at the correct height for the corresponding back height and torque the mounting hardware to 60-inch pounds.

18. Reinstall the armrest onto the wheelchair. Refer to INSTALLING/REMOVING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, 1081227.

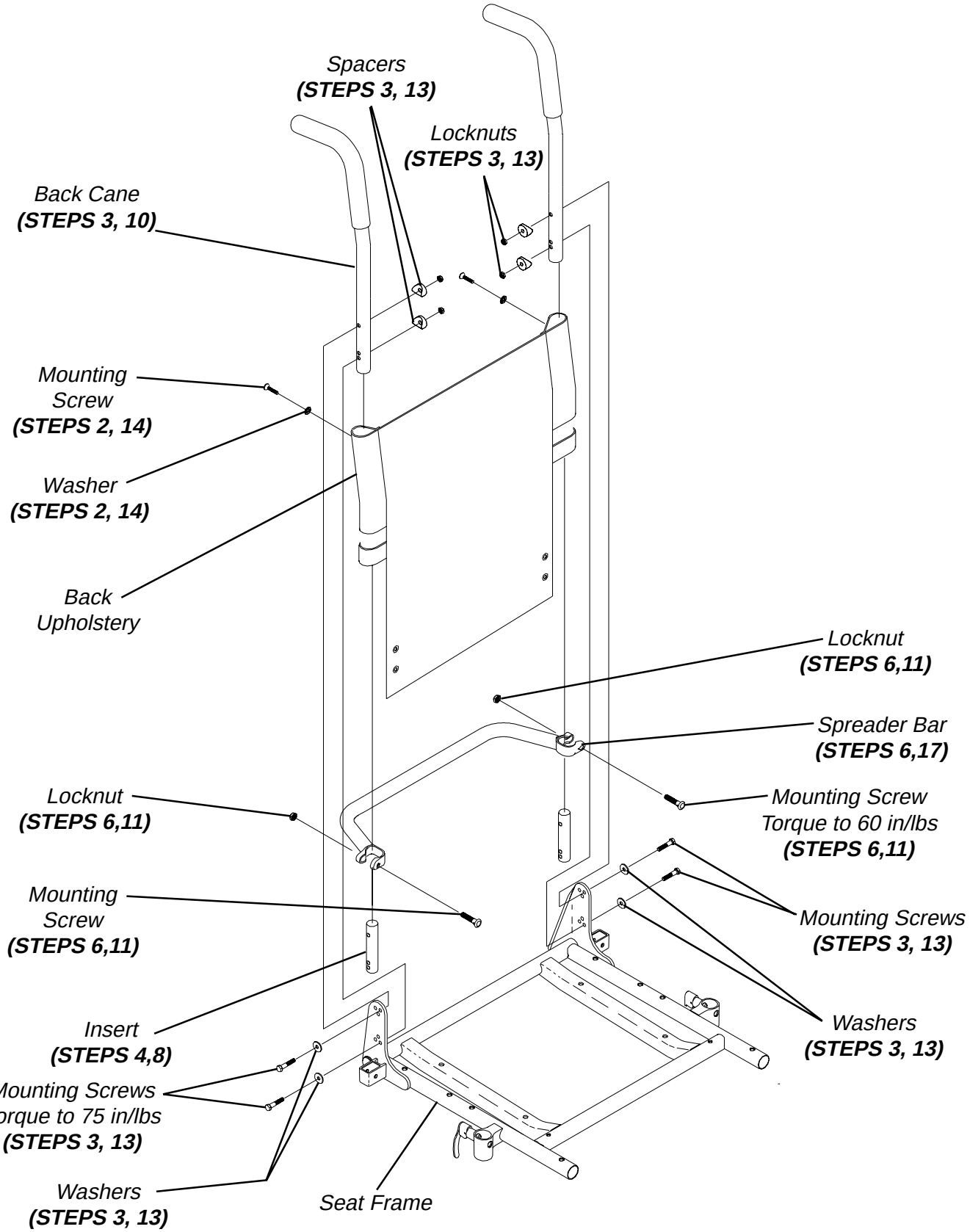


FIGURE 2 - CHANGING BACK HEIGHT

BACK ANGLE ADJUSTMENT (FIGURE 3)

1. Remove armrests from the wheelchair. Refer to INSTALLING/REMOVING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, 1081227.
2. Remove the mounting screw and washer from the top mounting hole of **back angle plate** and **back cane**.

NOTE: To avoid losing the insert in each back cane, thread the mounting screw through the cane from the inside of wheelchair to hold the insert in place.

3. Remove the mounting screw and washer from the bottom mounting hole of the **back angle plate** and **back cane**.
4. Reposition the back canes into the correct mounting holes of the **back angle plate** to obtain a back angle between 80° and 100° in 5° increments.
5. Torque mounting screws to 75-inch pounds.
6. Reinstall the armrests onto the wheelchair. Refer to INSTALLING/REMOVING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, 1081227.

TO ACHIEVE A BACK ANGLE OF:

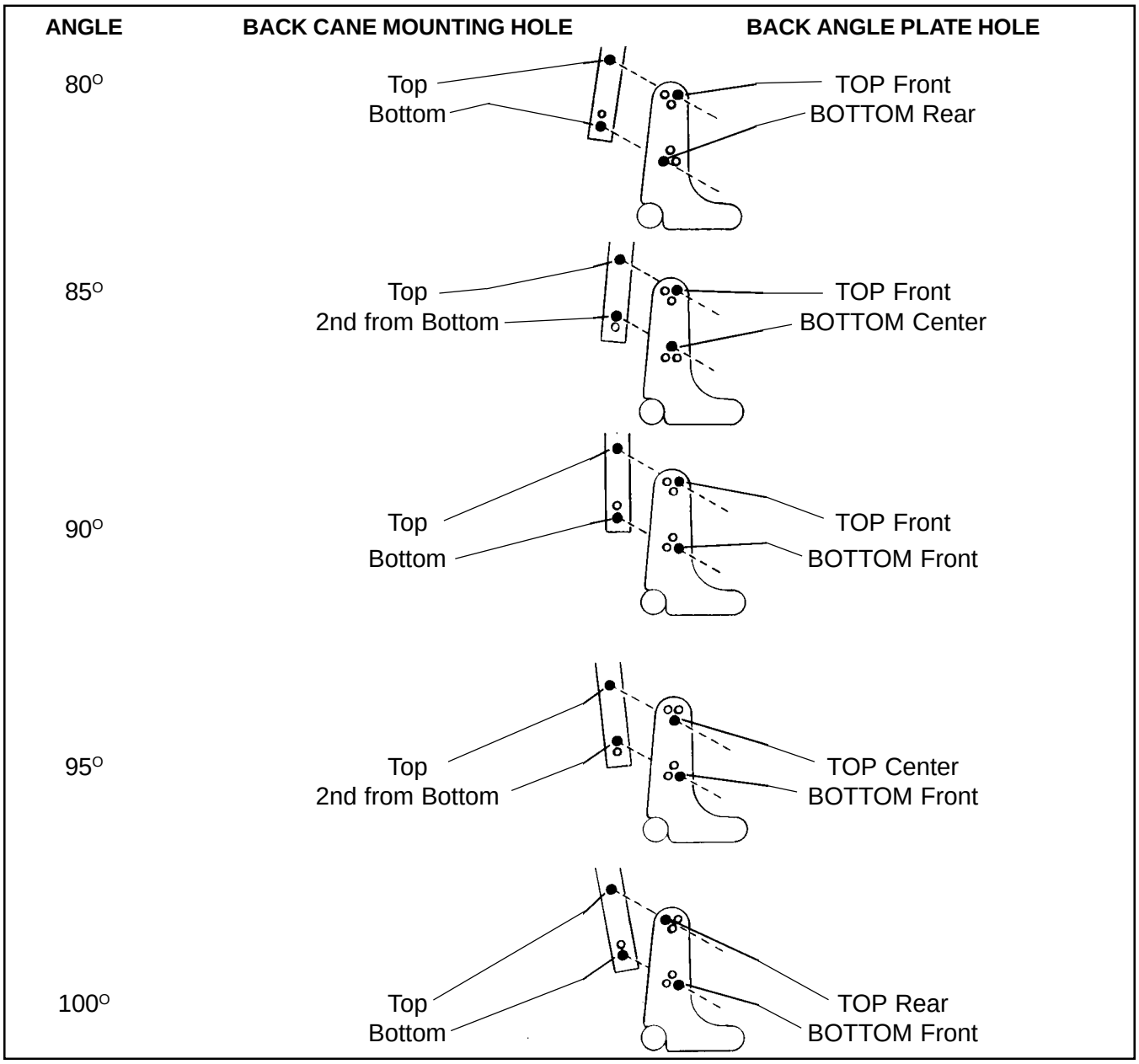


FIGURE 3 - BACK ANGLE ADJUSTMENT

This Procedure Includes the Following:
Installing/Removing Batteries Into/From Battery Box(es)
Disconnecting/Connecting Battery Cables
When to Charge Batteries
Charging Batteries
Replacing Batteries
Installing/Removing Battery Boxes -Group 24
Installing/Removing Battery Boxes - 22NF

WARNING

Make sure power to the wheelchair is OFF before performing this procedure.

The use of rubber gloves and chemical goggles or face shields is recommended when working with batteries.

Invacare strongly recommends that battery installation and battery replacement ALWAYS be done by a qualified technician.

After ANY adjustments, repair or service and BEFORE use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

INSTALLING/REMOVING BATTERIES INTO/FROM BATTERY BOXES (FIGURE 1)

NOTE: To remove the battery(ies) from the battery box(es), reverse the following procedure.

NOTE: Have the following tools available:

TOOL	QTY	COMMENTS
Battery Lifting Strap	1	Supplied
1/2-inch (6 pt) Box Wrench	1	Not Supplied

WARNING

ALWAYS use a battery lifting strap when lifting a battery. It is the most convenient method and assures that the battery acid will not spill. It also helps to prolong the life of the battery.

DO NOT tip the batteries. Keep the batteries in an upright position.

Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.

The warranty and performance specifications contained in this manual are based on the use of deep cycle gel cell or sealed lead acid batteries. Invacare strongly recommends their use as the power source for this unit.

NOTE: If there is battery acid in the bottom or on the sides of the battery box(es) or battery(ies), apply baking soda to these areas to neutralize the battery acid. Before reinstalling the NEW or existing battery(ies), clean the baking soda from the battery box(es) or battery(ies).

NOTE: When securing battery lifting strap to battery, observe polarity markings located on the ends of the battery lifting strap, (+) side to POSITIVE (+) battery post and (-) side to NEGATIVE (-) battery post.

1. If necessary, remove the battery box(es) from the wheelchair. Refer to REMOVING/INSTALLING BATTERY BOXES - GROUP 24 BATTERY BOX BASE FRAMES or INSTALLING/REMOVING BATTERY BOX - 22NF BATTERY BASE FRAMES in this procedure of the manual.
2. Disconnect battery cables. Refer to DISCONNECTING/CONNECTING BATTERY CABLES for one (1) of the following:
   A. Group 24 Batteries
   B. 22NF batteries in single battery box
3. Secure battery lifting strap to battery terminal(s)/post(s) (FIGURE 1).

CAUTION

Some battery manufacturers mold a carrying strap and/or hold down flanges directly into the battery case. Batteries which interfere with the battery box cannot be used for these applications. Attempting to "wedge" a battery into a battery box may damage the box and/or the battery.

4. Remove batteries from battery box(es).

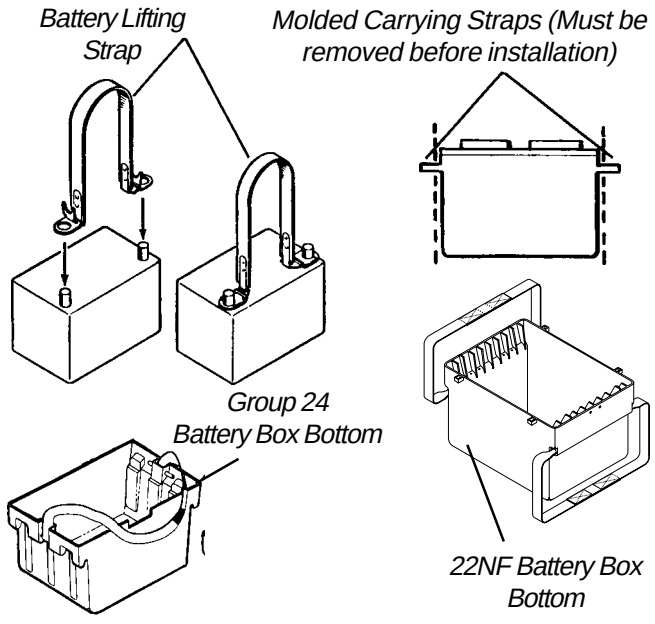

Battery Lifting Strap
Molded Carrying Straps (Must be removed before installation)
Group 24 Battery Box Bottom
22NF Battery Box Bottom

FIGURE 1 - INSTALLING/REMOVING BATTERIES INTO/FROM BATTERY BOXES

DISCONNECTING/CONNECTING BATTERY CABLES (FIGURE 2)

WARNING

NEVER allow any of your tools and/or battery cable(s) to contact BOTH battery post(s) at the same time. An electrical short may occur and serious personal injury or damage may occur.

The use of rubber gloves and chemical goggles or face shields is recommended when working with batteries.

When tightening the clamps, always use a box wrench. Pliers will "round off" the nuts. NEVER wiggle the battery terminal(s)/post(s) when tightening. The battery may become damaged.

The POSITIVE (+) RED battery cable MUST connect to the POSITIVE (+) battery terminal(s)/post(s), otherwise serious damage will occur to the electrical system.

Group 24 Batteries

DISCONNECTING.

NOTE: Perform this procedure on one (1) battery and battery box at a time. Repeat procedure for other battery box.

1. Lift up on battery box lid to expose underlying cables.
2. Peel back battery clamp covers to expose battery clamp on each battery cable as follows:
   A. RED battery clamp cover from RED battery cable.
   B. BLACK battery clamp cover from BLACK battery cable.
3. Disconnect NEGATIVE Ⓝ battery cable clamp from NEGATIVE(-) battery post
4. Disconnect POSITIVE Ⓟ battery cable clamp to POSITIVE (+) battery post (DETAIL "A").

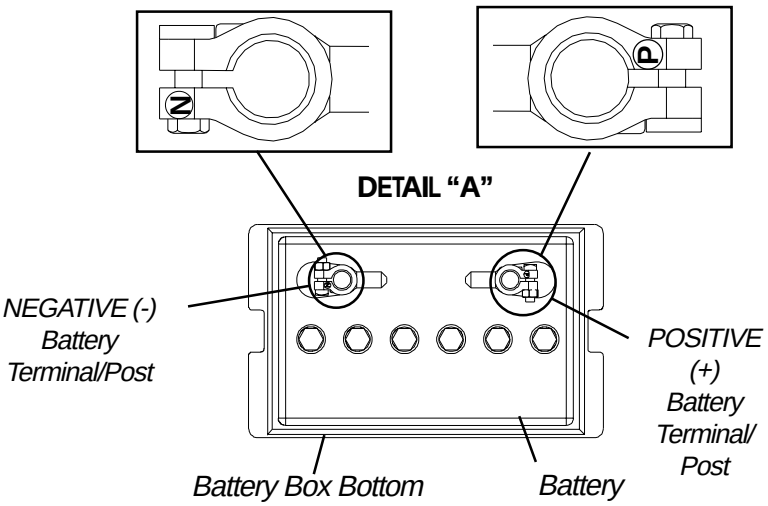
CONNECTING.

NOTE: Perform this procedure on one (1) battery and battery box at a time. Repeat procedure for other battery box.

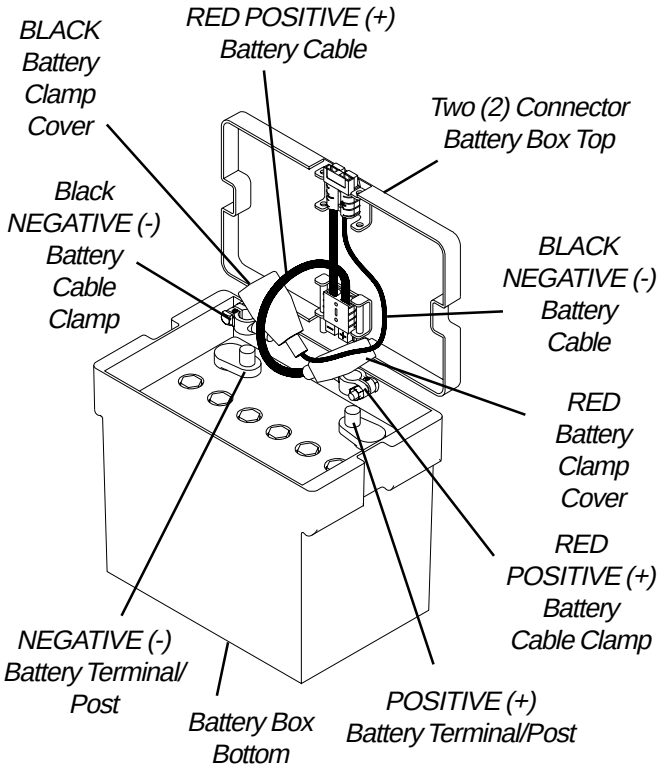
1. Position battery box top next to battery box bottom as shown in FIGURE 2.
2. Peel back battery clamp covers to expose battery clamp on each battery cable as follows:
   A. RED battery clamp cover from RED battery cable.
   B. BLACK battery clamp cover from BLACK battery cable.
3. Connect NEGATIVE Ⓝ battery cable clamp to NEGATIVE(-) battery post and connect POSITIVE Ⓟ battery cable clamp to POSITIVE (+) battery post (DETAIL "A").
4. Secure the battery cable clamp(s) to the battery post(s) with provided hex screws and nuts. Securely tighten.
5. Verify battery cable clamps(s) are correctly installed and securely tightened.
6. Reposition battery clamp covers over battery post(s).
7. Install the battery box top(s).
8. Install the battery box(es) into the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOX(ES) in this procedure of this manual.

NOTE: New Battery(ies) MUST be fully charged BEFORE using, otherwise the life of the battery(ies) will be reduced.

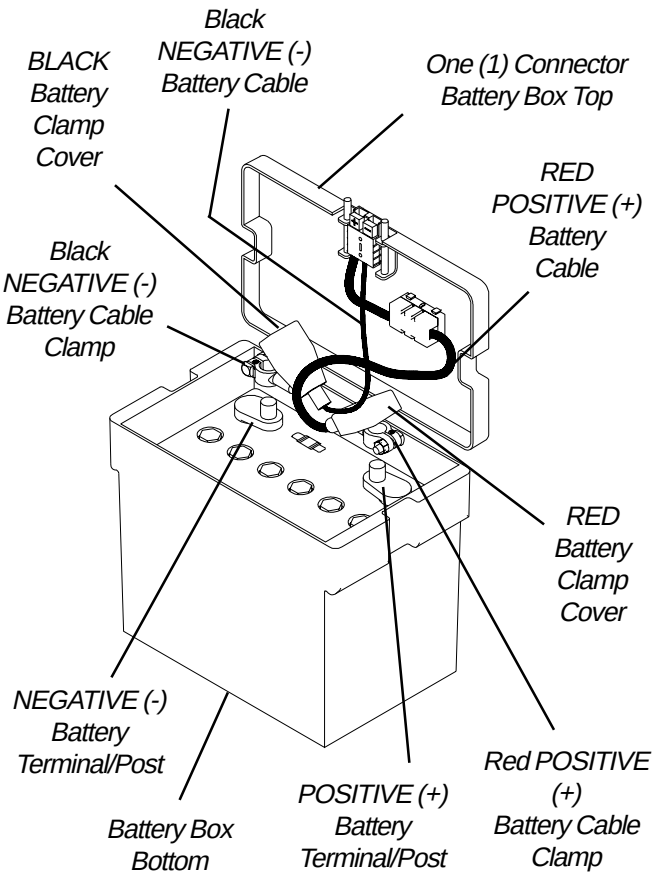
9. If necessary, charge the battery(ies). Refer to CHARGING BATTERIES in this procedure of the manual.



TWO (2) CONNECTOR BATTERY BOX


BLACK Battery Clamp Cover
RED POSITIVE (+) Battery Cable
Two (2) Connector Battery Box Top
Black NEGATIVE (-) Battery Cable Clamp
BLACK NEGATIVE (-) Battery Cable
RED Battery Clamp Cover
RED POSITIVE (+) Battery Cable Clamp
NEGATIVE (-) Battery Terminal/ Post
Battery Box Bottom
POSITIVE (+) Battery Terminal/Post

ONE (1) CONNECTOR BATTERY BOX


BLACK Battery Clamp Cover
Black NEGATIVE (-) Battery Cable
One (1) Connector Battery Box Top
RED POSITIVE (+) Battery Cable
Black NEGATIVE (-) Battery Cable Clamp
RED Battery Clamp Cover
NEGATIVE (-) Battery Terminal/Post
Battery Box Bottom
POSITIVE (+) Battery Terminal/Post
Red POSITIVE (+) Battery Cable Clamp

WARNING

Battery terminal polarity shown in illustration reflects the standard orientation for MK batteries. Different battery suppliers may have opposite battery terminal polarity. Always connect NEGATIVE battery cable clamp to NEGATIVE(-) battery terminal/post and POSITIVE battery cable clamp to POSITIVE (+) battery terminal/post, otherwise, injury or serious damage will occur to the electrical system.

FIGURE 2 - DISCONNECTING/CONNECTING BATTERY CABLE(S) - GROUP 24 BATTERIES

22NF Batteries in Single Battery Box (FIGURE 3)

NOTE: Note polarity of white battery cable (jumper) battery terminal ends.

DISCONNECTING.

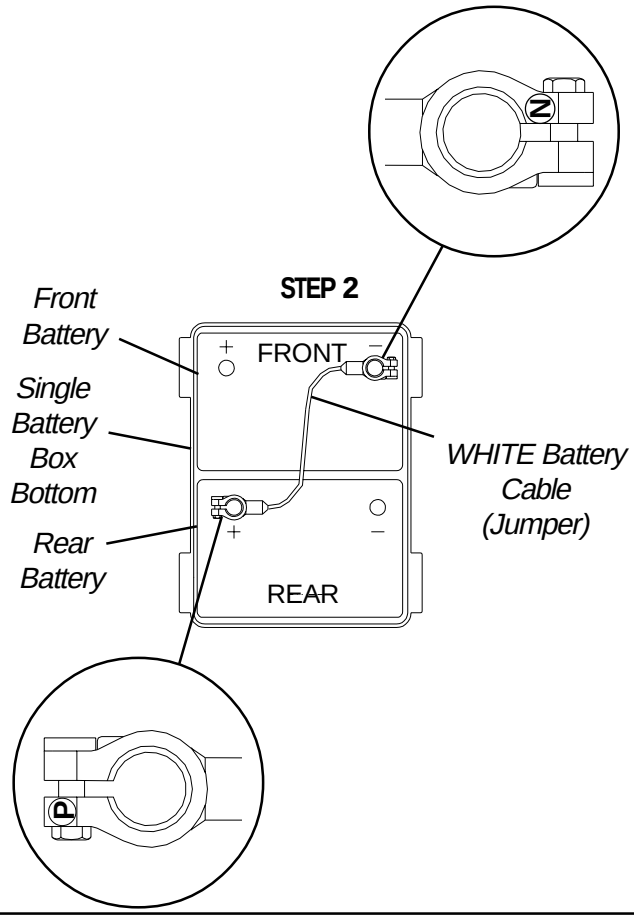
1. Remove battery terminal cap(s) from battery terminal(s) ends. Refer to DETAIL "A" in FIGURE 3.
2. Disconnect WHITE battery cable (jumper) NEGATIVE (N) terminal end from NEGATIVE (-) battery terminal/post of front battery and disconnect POSITIVE (P) terminal end from POSITIVE (+) battery terminal/post of rear battery.
3. Disonnect NEGATIVE (-) BLACK battery cable of the battery box top from NEGATIVE (-) battery terminal/post of rear battery.
4. Disonnect POSITIVE (+) RED battery cable on battery box top from POSITIVE (+) battery terminal/post of front battery.

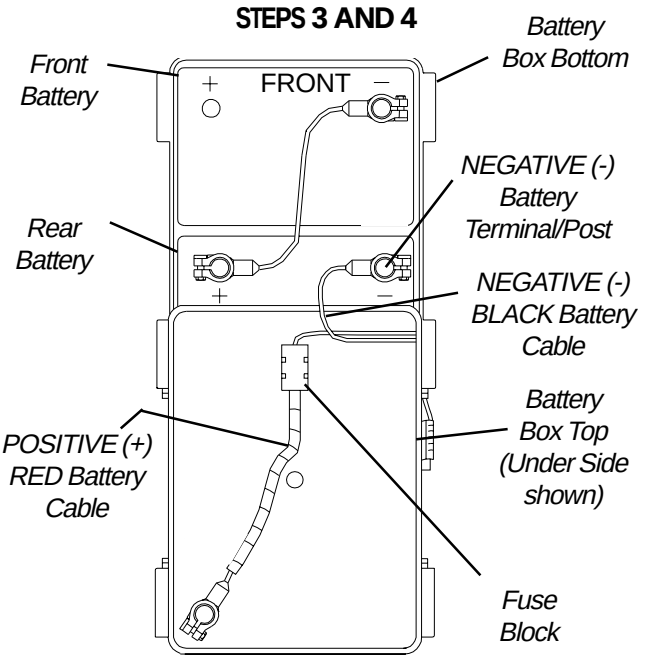
CONNECTING.

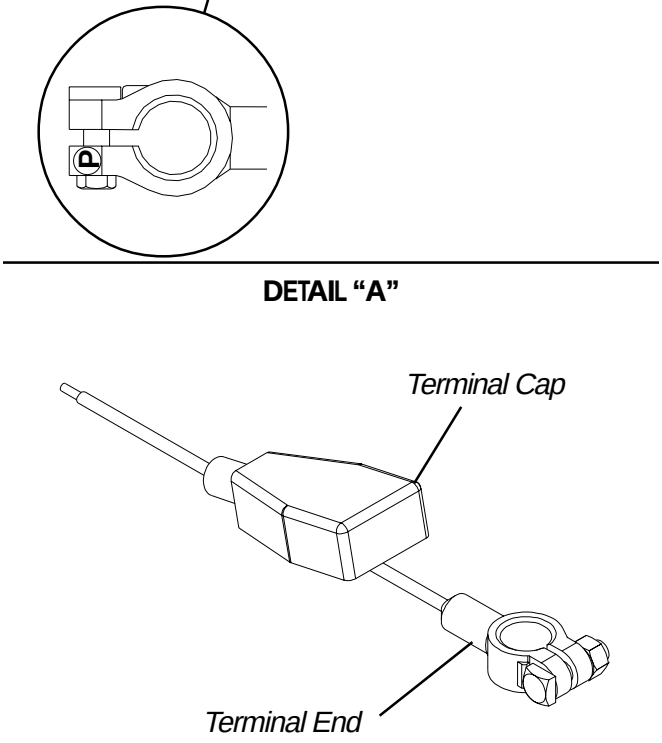
1. Remove battery terminal cap(s) from battery terminal(s) ends. Refer to DETAIL "A" in FIGURE 3.
2. Connect WHITE battery cable (jumper) NEGATIVE (N) terminal end to NEGATIVE (-) battery terminal/post of front battery and connect POSITIVE (P) terminal end to POSITIVE (+) battery terminal/post of rear battery.
3. Place battery top upside down on top of rear battery.
4. Connect NEGATIVE (-) BLACK battery cable of the battery box top to NEGATIVE (-) battery terminal/post of rear battery.
5. Position battery box top right side up and rotate outward toward right to expose POSITIVE (+) battery terminal/post of front battery.
6. Connect POSITIVE (+) RED battery cable on battery box top to POSITIVE (+) battery terminal/post of front battery.
7. Replace battery terminal cap(s) onto battery cable terminal end(s).
8. Rotate top toward left into position. Secure in place.
9. Install the battery box into the wheelchair. Refer to INSTALLING/REMOVING 22NF BATTERY BOX in PROCEDURE 7 of this manual.

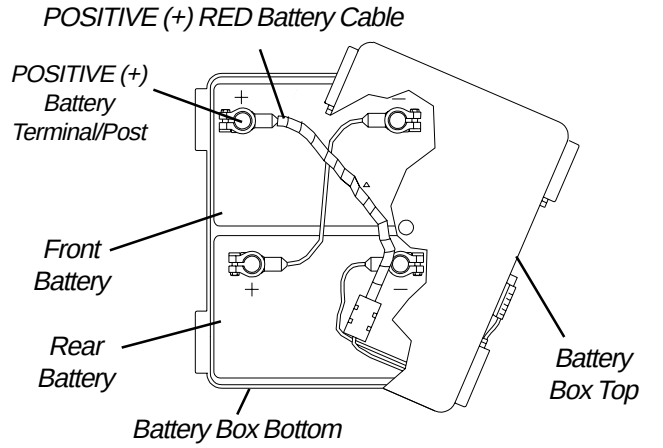
NOTE: New Battery(ies) MUST be fully charged BEFORE using, otherwise the life of the battery(ies) will be reduced.

10. If necessary, charge the battery(ies). Refer to CHARGING BATTERIES in PROCEDURE 7 of this manual.







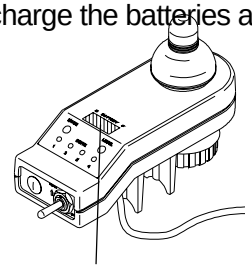


NOTE: Battery box top cut away for clarification purposes only.

FIGURE 3 - CONNECTING BATTERY CABLES - SINGLE 22NF BATTERY BOX

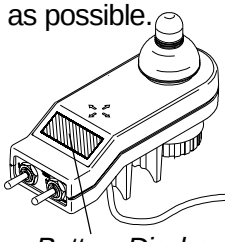
WHEN TO CHARGE BATTERIES (FIGURE 4)

The Battery Discharge Indicator (BDI) is a bar graph display located on the MKIV joystick. It will keep you informed as to power availability. A visual warning is given before the power becomes too low to operate the wheelchair. At full charge the two (2) LEFT segments and the farthest RIGHT segment of the bar graph will be illuminated. As the battery becomes discharged, the farthest RIGHT segment will progressively move to the LEFT until only the last two (2) bars (LEFT) are illuminated. At this level the last two (2) bars (LEFT) will start to Flash ON and OFF to indicate that the end user should charge the batteries as soon as possible.



Battery Discharge Indicator (BDI)

MKIV- A JOYSTICK



Battery Discharge Indicator (BDI) (in LCD Readout)

MKIV- A+ JOYSTICK

Battery Discharge Indicator (BDI)

MKIV- RII JOYSTICK (TORQUE SP ONLY)

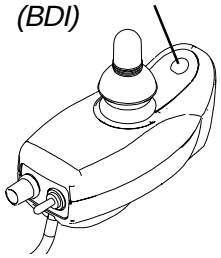


FIGURE 4 - WHEN TO CHARGE BATTERIES

CHARGING BATTERIES (FIGURE 5)

NOTE: New batteries MUST be fully charged prior to initial use of the wheelchair.

WARNING

Never attempt to recharge the batteries by attaching cables directly to the battery terminals or clamps. Always use the recharging plug located on the side of the wheelchair frame.

DO NOT attempt to recharge the batteries and operate the power wheelchair at the same time.

During use and charging, unsealed batteries will vent hydrogen gas which is explosive in the right concentration with air.

CAUTION

Always charge new batteries before initial use or battery life will be reduced.

NOTE: As a general rule, batteries should be recharged daily to assure the longest possible life and minimize the required charging time. Plan to recharge the batteries when it is anticipated the wheelchair will not be used for a long period of time.

The range per battery charge using recommended batteries should be approximately 5 to 9 hours of typical operation. Extensive use on inclines may substantially reduce per charge mileage.

Description and Use of Battery Chargers

The charger automatically reduces the charge from an initially high rate to a zero reading at a fully charged condition. If left unattended, the charger should automatically shut-off when full charge is obtained.

There are some basic concepts which will help you understand this automatic process. They are:

The amount of electrical current drawn within a given time to charge a battery is called the “charge rate”. If, due to usage, the charge stored in the battery is low, the charge rate is high, as indicated by the green light on the charger. Initially, the green light will stay illuminated for a short period of time followed by a longer period of off time. As a charge builds up, the charge rate is reduced, and the green light will stay illuminated for a longer period of time followed by a shorter off time.

WARNING

NEVER leave the charger unattended when the charger circuit breaker is tripping ON and OFF. A condition between the battery charger and batteries exists. Contact an Invacare dealer.

NOTE: If performing the charging procedures independently, READ and CAREFULLY follow the individual instructions for each charger (supplied or purchased).

NOTE: If charging instructions are not supplied, consult a qualified service technician for proper procedures.

Required Items:

TOOL	QUANTITY	COMMENTS
Battery Charger	1	Supplied
◆Extension Cord	1	Not Supplied

◆ (3-prong plug, 15 ampere current rating; industrial type)

1. Perform one (1) of the following:
   A. **WHEELCHAIRS EQUIPPED WITH MCC-MARK IV JOYSTICK** - Attach the battery charger connector to the charger cable/battery harness.

NOTE: The battery charger connector is factory installed on the RIGHT side of the wheelchair. It can be positioned on either side of the wheelchair for user convenience.

NOTE FOR RECLINERS ONLY: If the wheelchair is a recliner, the battery charger connector as well as the limit switch, are factory set on the RIGHT side of the wheelchair. However, they can be positioned on either side for user convenience. The limit switch MUST BE positioned on the same side as the battery charger connector.

   B. **TORQUE SP EQUIPPED WITH MARK IV RII JOYSTICK-** Attach the battery charger connector to the charger port on the FRONT of the joystick.

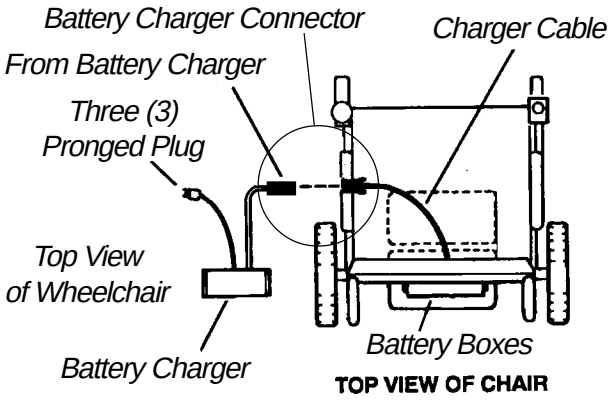
2. Plug the charger's AC power cord, or extension, into the grounded 120 VAC wall outlet.
3. Wait until charging is complete.

NOTE: Allow eight (8) hours for normal charging. Larger batteries (greater than 55 ampere-hours) or severely discharged batteries may require up to sixteen (16) hours to be properly charged and equalized. If charger operates for sixteen (16) hours and is unable to fully charge the batteries, an internal timer turns the charger off and begins to fast blink the green light.

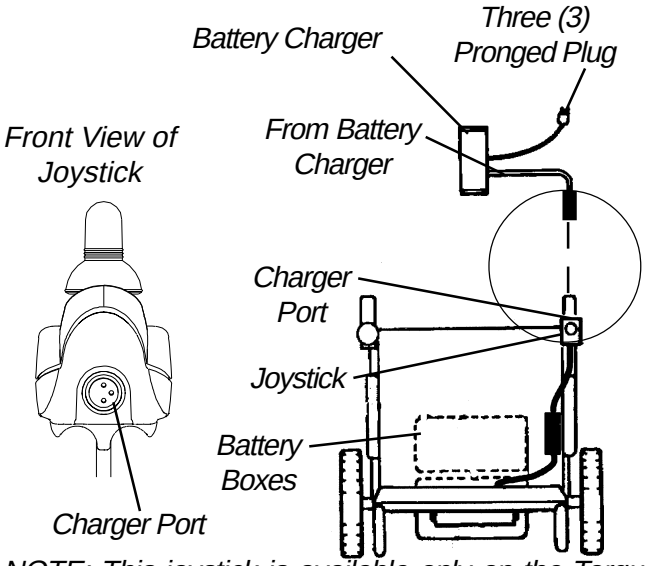
NOTE: It is advantageous to recharge frequently rather than only when necessary. In fact, a battery's life is extended if the charge level is maintained well above a low condition.

NOTE: If the batteries need to be charged more often or take longer to charge than normal, they may need to be replaced. Contact an Invacare dealer for service.

WHEELCHAIRS EQUIPPED WITH MCC-MARK IV JOYSTICK



WHEELCHAIRS EQUIPPED WITH MARK IV RII JOYSTICK



NOTE: This joystick is available only on the Torque SP.

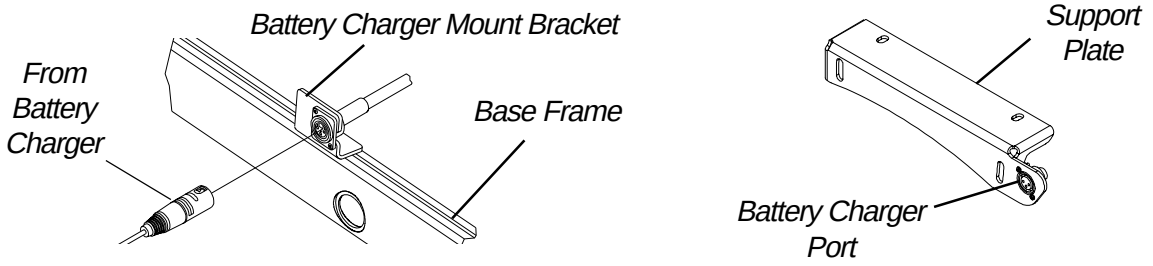


FIGURE 5 - CHARGING BATTERIES

REPLACING BATTERIES

NOTE: Invacare recommends that both batteries be replaced if one (1) battery is defective.

Recommended Battery Types

WARNING

Failure to use the correct battery size and/or voltage may cause damage to your wheelchair and give you unsatisfactory performance.

The warranty and performance specifications contained in this manual are based on the use of deep cycle gel cell or sealed lead acid batteries. Invacare strongly recommends their use as the power source for this unit.

NOTE: G/B denotes gearless/brushless. Both battery sizes are deep cycle batteries.

NOTE: Charge batteries daily. It is critical not to let them run low at any time.

1. Remove the battery box(es) from the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
2. Remove existing batteries from the battery box(es). Refer to INSTALLING/REMOVING BATTERIES INTO/FROM BATTERY BOX(ES) in this procedure of manual.
3. Clean the new battery terminals. Refer to CLEANING BATTERY TERMINALS in this procedure of the manual.
4. Install the new batteries into the battery box(es). Refer to INSTALLING/REMOVING BATTERIES INTO/FROM BATTERY BOX(ES) in this procedure of the manual.
5. Install the battery box(es) from the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.

BATTERY REQUIREMENTS AND WEIGHT LIMITATIONS

MODEL	WEIGHT LIMITATION	MOTOR	BATTERY
ARROW	Up to 300 lbs	Gearless/Brushless	Group 24
	Up to 400 lbs	4 Pole Motor	Group 24
TORQUE SP	Up to 250 lbs	4 Pole Motor	*22NF
	251-300 lbs	4 Pole Motor	*22NF
		Gearless/Brushless	Group 24
	301-350 lbs	4 Pole Motor	Group 24
RANGER X	Up to 300 lbs.	4 Pole Motor	Group 24
		Gearless/Brushless	Group 24

* Two batteries inside one battery box.

NOTE: Weight limitation is total weight: user weight plus any additional items that the user may require (back pack, etc.). (Example: If weight limitation of the chair is 300 lbs. and additional items equal 25 lbs. subtract 25 lbs from 300 lbs. This gives the maximum weight limitation of the user to be 275 lbs.)

Cleaning Battery Terminals

WARNING

Most batteries are not sold with instructions. However, warnings are frequently noted on the cell caps. Read them carefully.

DO NOT allow the liquid in the battery to come in contact with skin, clothes or other possessions. It is a form of acid and harmful or damaging burns may result. Should the liquid touch your skin, wash the area IMMEDIATELY and thoroughly with cool water. In serious cases or if eye contact is made, seek medical attention IMMEDIATELY.

1. Examine battery clamps and terminals for corrosion.
2. Verify the plastic caps are in place over battery cell holes.
3. Clean terminals and inside battery clamps by using a battery cleaning tool, wire brush, or medium grade sand paper.

NOTE: Upon completion, areas should be shiny, not dull.

4. Carefully dust off all metal particles.

REMOVING/INSTALLING GROUP 24 BATTERY BOXES FOR WHEELCHAIRS NOT EQUIPPED WITH VENT TRAY (FIGURE 6)

WARNING

Each battery weighs 51 pounds. Use proper lifting techniques (lift with your legs) to avoid injury.

Removing

1. Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.
2. Verify the joystick ON/OFF switch is in the OFF position.
3. Rotate the levers of the battery retainer assembly to the unlocked position.
4. Lift battery retainer assembly up off the mounting screws that secure the shocks to the base frame.

NOTE: For gearless/brushless motors, ensure that the motor lock levers are in the engaged (drive) position. Refer to PROCEDURE 9.

5. Slide one (1) connector battery box along the sub-frame and remove from the wheelchair.
6. Slide the two (2) connector battery box along the sub-frame and remove from the wheelchair.

Installing

1. Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.
2. Verify the joystick ON/OFF switch is in the OFF position.
3. Secure the battery box carrying strap to the lid of the two (2) connector battery box.
4. Place two (2) connector battery box onto the battery sub-frame assembly with guide pins facing the inside of the wheelchair.
5. Slide the two (2) connector battery box along the sub-frame until its guide pins are engaged in the sub-frame connector.

NOTE: Visually inspect to ensure the connection is properly made. Connectors MUST be fully engaged.

NOTE: Make certain that the battery box carrying strap is positioned on top of the battery box and will not interfere with the one (1) battery box guide pins when engaging the connector on the one (1) battery box lid.

6. Secure the battery box carrying strap to the lid of the one (1) connector battery box.
7. Place one (1) connector battery box onto battery sub-frame.
8. Slide one (1) connector battery box along the sub-frame until its guide pins are engaged in the connector of the two (2) connector battery box.

NOTE: Visually inspect to ensure the connection is properly made. Connectors MUST be fully engaged.

9. Place the battery retainer assembly on head portion of the mounting screws that secure the shocks to the base frame.

CAUTION

The battery retainer assembly MUST be locked securely to hold the battery boxes firmly in place or battery box connectors may be damaged causing erratic wheelchair operation.

10. Rotate the levers of the battery retainer assembly to the locked position.

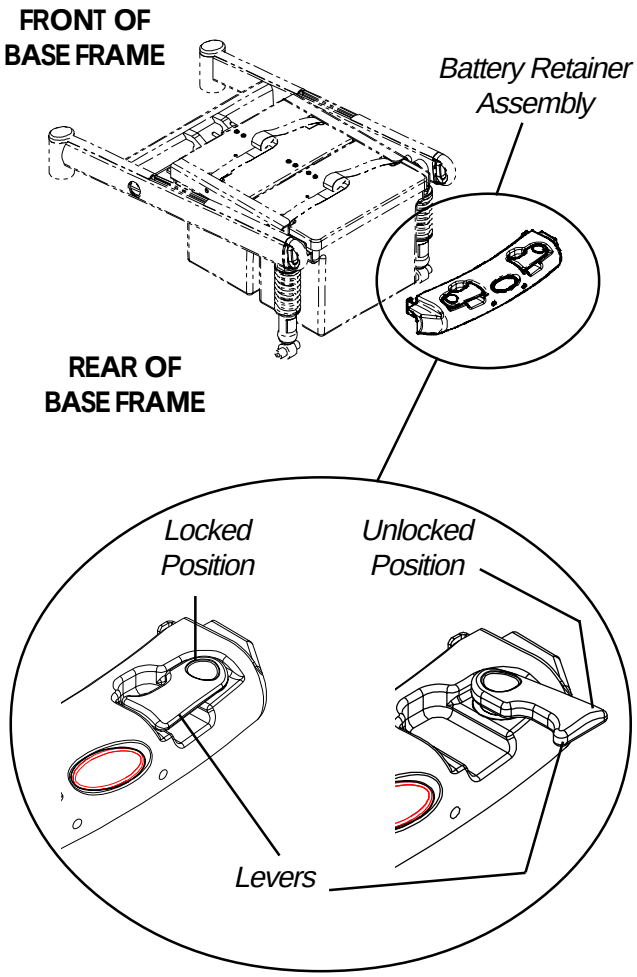


FIGURE 6 - REMOVING/INSTALLING GROUP 24 BATTERY BOXES FOR WHEELCHAIRS WITHOUT VENT TRAY

REMOVING/INSTALLING GROUP 24 BATTERY BOXES FOR WHEELCHAIRS EQUIPPED WITH VENT TRAY (FIGURE 7)

WARNING

Each battery weighs 51 pounds. Use proper lifting techniques (lift with your legs) to avoid injury.

Removing

1. Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.
2. Verify the joystick ON/OFF switch is in the OFF position.
3. Pull the battery box retainer UP over the end of the one (1) connector battery box.
4. Slide one (1) connector battery box along the sub-frame and remove from the wheelchair.
5. Slide the two (2) connector battery box along the sub-frame and remove from the wheelchair.

Installing

1. Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.
2. Verify the joystick ON/OFF switch is in the OFF position.
3. Secure the battery box carrying strap to the lid of the two (2) connector battery box.
4. Place two (2) connector battery box onto the battery sub-frame assembly with guide pins facing the inside of the wheelchair.
5. Slide the two (2) connector battery box along the sub-frame until its guide pins are engaged in the sub-frame connector.

NOTE: Visually inspect to ensure the connection is properly made. Connectors MUST be fully engaged.

NOTE: Make certain that the battery box carrying strap is positioned on top of the battery box and will not interfere with the one (1) battery box guide pins when engaging the connector on the one (1) battery box lid.

6. Secure the battery box carrying strap to the lid of the one (1) connector battery box.

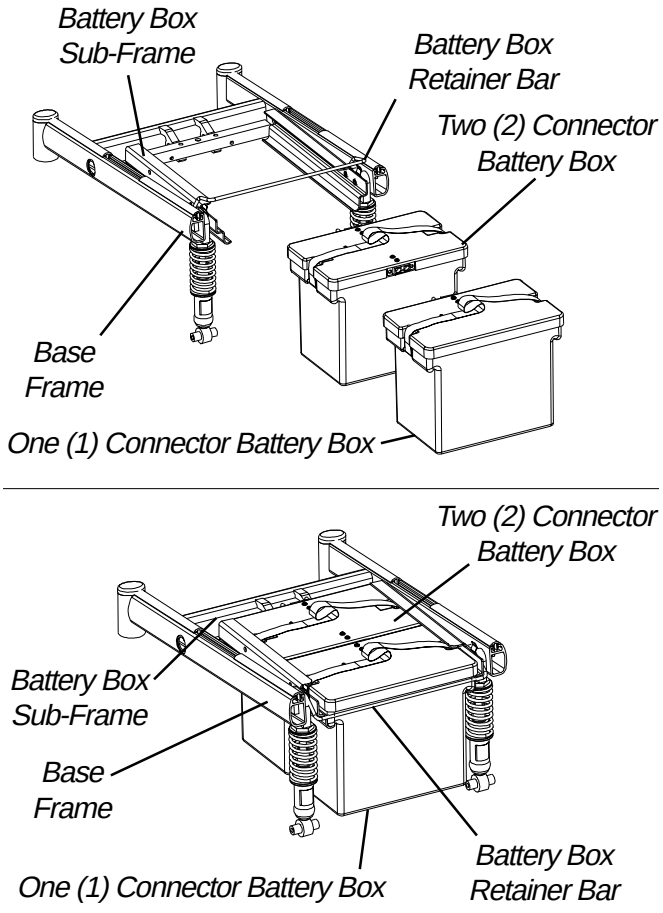


FIGURE 7 - INSTALLING/REMOVING GROUP 24 BATTERY BOXES FOR WHEELCHAIRS EQUIPPED WITH VENT TRAY

7. Place one (1) connector battery box onto battery sub-frame.
8. Slide one (1) connector battery box along the sub-frame until its guide pins are engaged in the connector of the two (2) connector battery box.

NOTE: Visually inspect to ensure the connection is properly made. Connectors MUST be fully engaged.

CAUTION

The battery box retainer MUST be locked securely to hold the battery boxes firmly in place or battery box connectors may be damaged causing erratic wheelchair operation.

9. Pull the battery box retainer down over the end of the one (1) connector battery box until it is securely clipped (locked) into place.

INSTALLING/REMOVING BATTERY BOX - 22NF BATTERY BASE FRAMES (FIGURE 8)

NOTE: To install the battery box onto the wheelchair, reverse the following procedure.

1. Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.
2. Verify the joystick ON/OFF switch is in the OFF position.
3. Disconnect the battery cable from the outside of the battery box.
4. Disconnect the battery box retention strap.
5. Remove the battery box.
6. Slide the four (4) clips that secure the battery box cover to the battery box to the OPEN position.

NOTE: Arrows on the battery box cover point to the open position.

7. Remove battery box cover from the battery box.

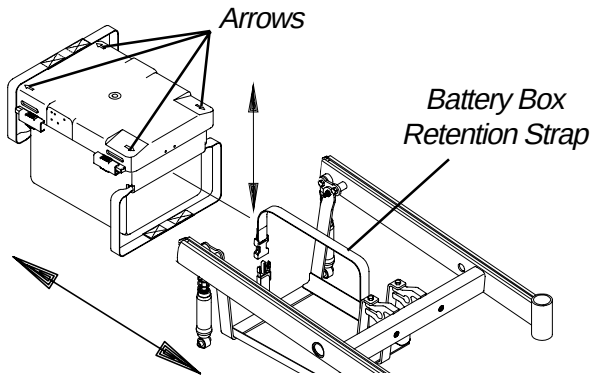


FIGURE 8 - INSTALLING/REMOVING BATTERY BOX - 22NF BATTERY BASE FRAMES

This Procedure includes the following:
Removing/Installing the Wiring Harness
Adjusting Limit Switch

WARNING

After ANY adjustments, repair or service and BEFORE use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

REMOVING/INSTALLING THE WIRING HARNESS (FIGURE 1)

Group 24 Batteries

REMOVING.

1. Remove the battery box(es). Refer to INSTALLING/REMOVING GROUP 24 BATTERY BOXES in PROCEDURE 9 of this manual.
2. Remove the two mounting screws and locknuts that secure the wiring harness bracket to the base frame (DETAIL "A").
3. Perform one (1) of the following sections:

WHEELCHAIRS WITH MOTOR/GEARBOX ASSEMBLY

A. Cut tie-wraps **A** and **B** that secure the two (2) motor/controller connections and the controller/wiring harness connection (BLUE connectors) together (DETAIL "B").

B. Cut tie-wrap **C** that secures the battery charger cable, motor connector cable, controller connector cable, and wiring harness cable to the base frame (DETAIL "B").

WHEELCHAIRS WITH GEARLESS/BRUSHLESS MOTOR

A. Cut tie-wrap A that secures the battery charger cable to the base frame (DETAIL "C").

NOTE: For STEPS 4-6 refer to Detail "B" or "C".

4. Disconnect the battery harness/charger cable **(BLUE)** from the controller connector **(BLUE)**.
5. Remove the two mounting screws that secure the charger cable to the mounting bracket.
6. Remove the wiring harness.

Installing

1. Install NEW wiring harness w/bracket to the rear of the sub-frame and torque mounting screws to 160-inch pounds (DETAIL "A").
2. Secure the charger cable to the mounting bracket with the two (2) mounting screws. Securely tighten (DETAIL "B" OR "C").
3. Connect the battery harness/charger cable **(BLUE)** to the controller connector **(BLUE)** (DETAIL "B" or "C").
4. Perform one (1) of the following sections:

WHEELCHAIRS WITH MOTOR/GEARBOX ASSEMBLY

A. Group the two (2) motor/controller connections together along with the controller/wiring harness connection **(BLUE)** and secure with **TIE-WRAPS A and B** (DETAIL "B").

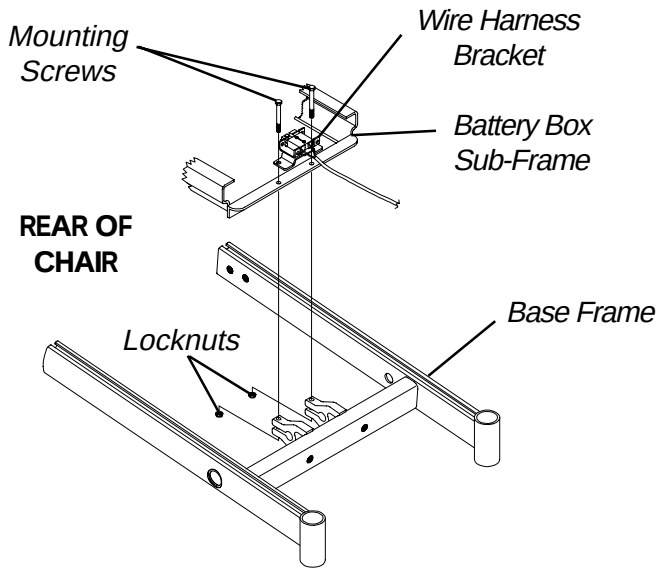
B. Secure the Wiring Harness Cable, Battery Charger Cable, Controller Connector Cable, and Motor Connector Cable to the suspension arm with **TIE-WRAP C** (DETAIL "B").

WHEELCHAIRS WITH GEARLESS/BRUSHLESS MOTOR OPTION:

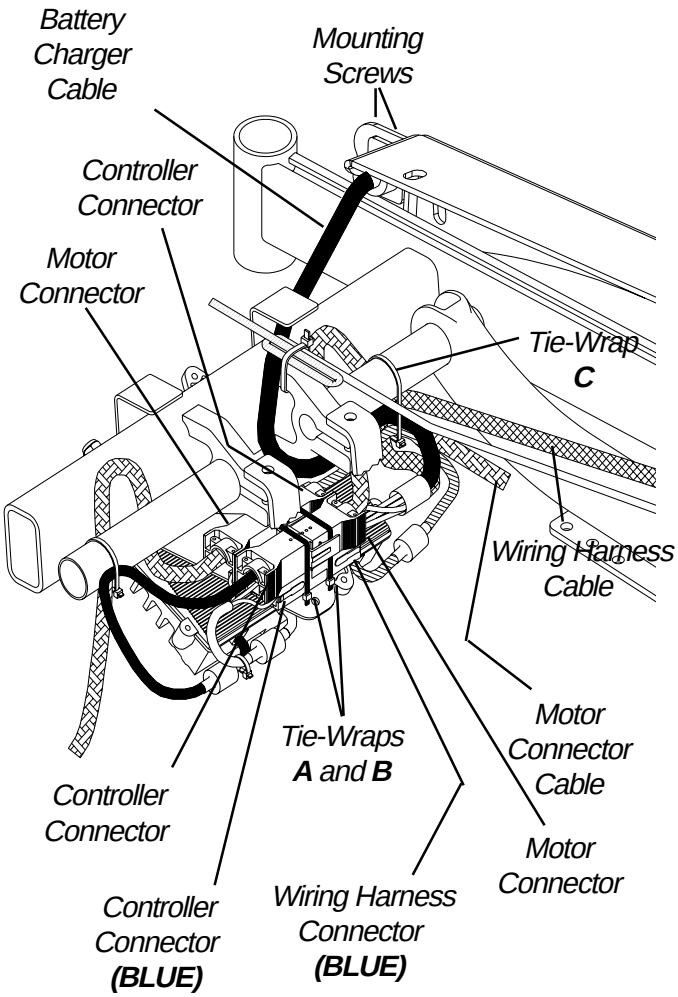
A. Secures the battery charger cable to the base frame with **TIE-WRAP A** (DETAIL "C").

5. Reinstall the battery box(es). Refer to INSTALLING/REMOVING GROUP 24 BATTERY BOXES in PROCEDURE 9 of this manual.

DETAIL A - GROUP 24 BATTERIES



DETAIL "B" - WHEELCHAIRS WITH MOTOR/ GEARBOX ASSEMBLY



DETAIL "C" - WHEELCHAIRS WITH GEARLESS / BRUSHLESS MOTOR

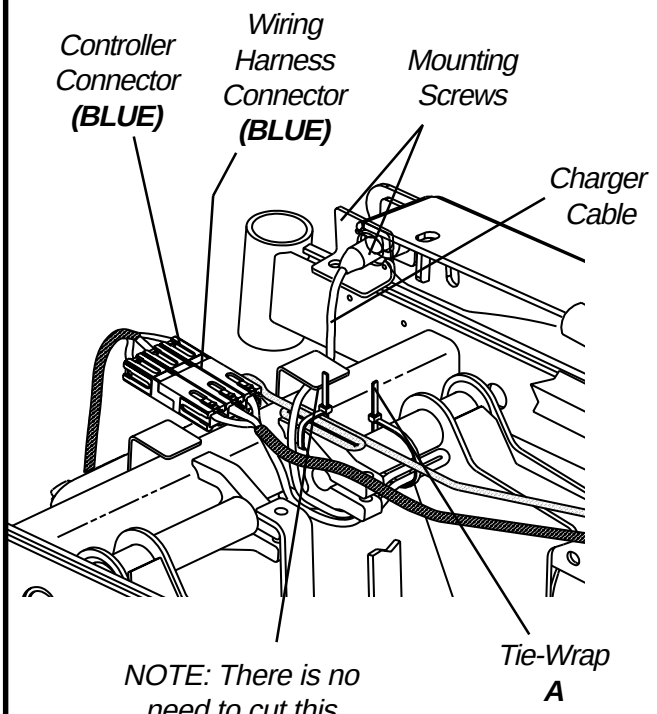


FIGURE 1 - REMOVING/INSTALLING THE WIRING HARNESS

22NF Batteries

REMOVING.

1. Remove the battery box(es). Refer to INSTALLING/REMOVING 22NF BATTERY BOX in PROCEDURE 9 of this manual.
2. Cut the tie wrap that secures the rear portion of the wiring harness and joystick cable to the rear of the seat frame (DETAIL "A").
3. Perform one (1) of the following sections:

WHEELCHAIRS WITH MOTOR/GEARBOX ASSEMBLY

A. Cut tie-wraps **A** and **B** that secure the two (2) motor/controller connections and the controller/wiring harness connection (BLUE connectors) together (DETAIL "B").

B. Cut tie-wrap **C** that secures the battery charger cable, motor connector cable, controller connector cable, and wiring harness cable to the base frame (DETAIL "B").

WHEELCHAIRS WITH GEARLESS/BRUSHLESS MOTOR

A. Cut tie-wrap A that secures the battery charger cable to the base frame (DETAIL "C").

NOTE: For STEPS 4-6 refer to Detail "B" or "C".

4. Disconnect the battery harness/charger cable **(BLUE)** from the controller connector **(BLUE)**.
5. Remove the two mounting screws that secure the charger cable to the mounting bracket.
6. Remove the wiring harness.

Installing

1. Secure the charger cable to the mounting bracket with the two (2) mounting screws. Securely tighten (DETAIL "B" or "C").
2. Connect the battery harness/charger cable **(BLUE)** to the controller connector **(BLUE)** (DETAIL "B" or "C").
3. Perform one (1) of the following sections:

WHEELCHAIRS WITH MOTOR/GEARBOX ASSEMBLY

A. Group the two (2) motor/controller connections together along with the controller/wiring harness connection **(BLUE)** and secure with **TIE-WRAPS A and B** (DETAIL "B").

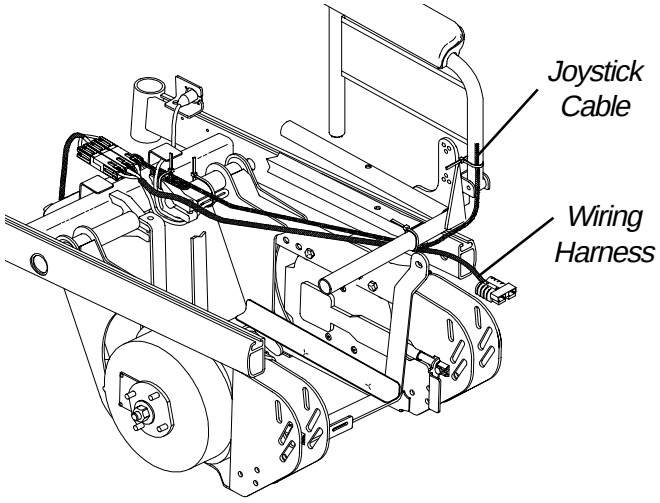
B. Secure the Wiring Harness Cable, Battery Charger Cable, Controller Connector Cable, and Motor Connector Cable to the suspension arm with **TIE-WRAP C** (DETAIL "B").

WHEELCHAIRS WITH GEARLESS/BRUSHLESS MOTOR OPTION:

A. Secures the battery charger cable to the base frame with **TIE-WRAP A** (DETAIL "C").

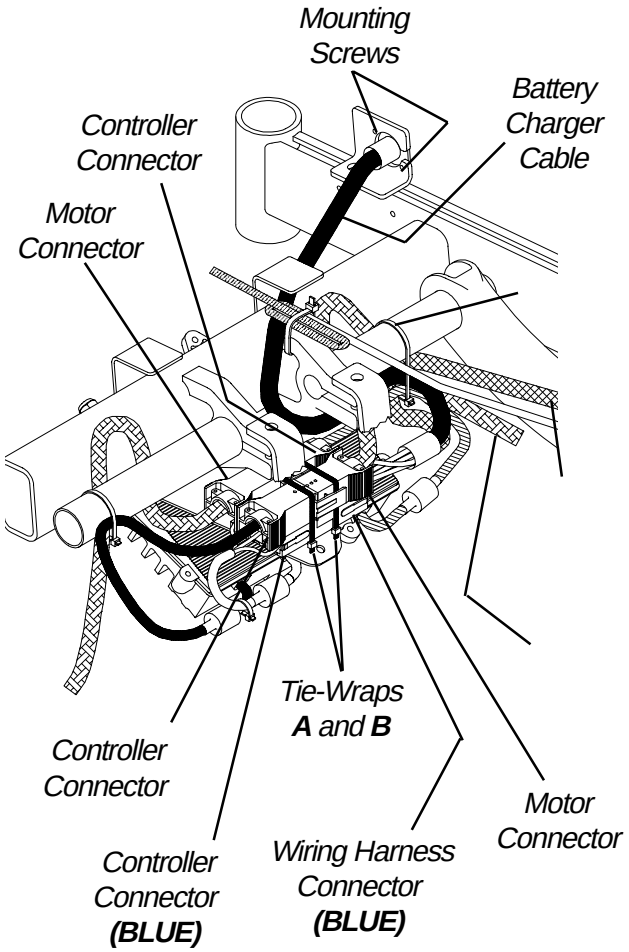
4. Tie-wrap NEW wiring harness and joystick cable to the rear of the seat frame (DETAIL "A").
5. Reinstall the battery box(es). Refer to INSTALLING/REMOVING 22NF BATTERY BOX in PROCEDURE 9 of this manual.

DETAIL "A" - 22NF BATTERIES

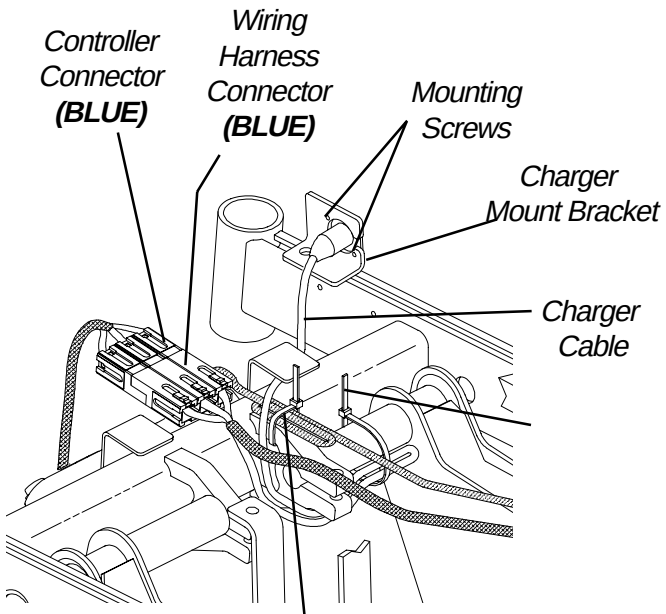


NOTE: Illustration depicts gearless/brushless motor. Wiring harness is secured to the rear of the seat frame in the same manner for wheelchairs with conventional motor/gearbox assembly.

DETAIL "B" - WHEELCHAIRS WITH GEARLESS / BRUSHLESS MOTOR



DETAIL "C" - WHEELCHAIRS WITH GEARLESS / BRUSHLESS MOTOR



NOTE: There is no need to cut this tie-wrap.

FIGURE 1 - REMOVING/INSTALLING THE WIRING HARNESS

ADJUSTING LIMIT SWITCH (FIGURE 2)

NOTE: The following procedure is for high back captains van seat model wheelchairs only.

WARNING

NEVER operate the wheelchair while in any recline position over 114° RELATIVE TO THE SEAT FRAME. If the limit switch does not stop the wheelchair from operating in a recline position greater than 114° RELATIVE TO THE SEAT FRAME, DO NOT operate the wheelchair. Adjust the limit switch BEFORE using the wheelchair, otherwise injury or damage can occur.

1. Place the wheelchair on a level surface.
2. Recline the captains van seat back to a 24° to achieve the 114° angle relative to the seat frame. Refer to ADJUSTING CAPTAINS VAN SEAT in PROCEDURE 4 of the owner's manual, 1081227.

NOTE: The captains van seat frame is at a 5° angle relative to the ground. When the back angle is adjusted to 114° relative to the seat, it will measure 61° relative to the ground.

NOTE: To determine 114° back angle relative to the seat frame, place a magnetic protractor (available at any hardware store) on the back as shown in FIGURE 2 and adjust the back until the magnetic protractor reads 61°.

3. Turn the wheelchair power switch on the joystick to the ON position.

NOTE: The wheelchair should not operate.

4. **IF** wheelchair operates, proceed to the following steps to adjust the actuator on the upper limit switch bracket:
   A. Fully recline the back. Refer to ADJUSTING CAPTAINS VAN SEAT in PROCEDURE 4 of the Owner's Manual, 1081227.

   NOTE: This will make access to the limit switch easier.

   B. Loosen, but do not remove, the two (2) phillips screws, washers and locknuts that secure the actuator to the upper limit switch bracket.
   C. Slide the actuator UP (towards the top of the wheelchair).

CAUTION

DO NOT over tighten the phillips screws that secure the actuator to the upper limit switch bracket. Damage to the actuator can occur.

   D. Only tighten the two (2) phillips screws, washers and locknuts that secure the actuator to the upper limit switch bracket until the actuator does not move.
   E. Repeat STEPS 1-3 until the wheelchair does not operate when the captains van seat back is at a 24° angle.

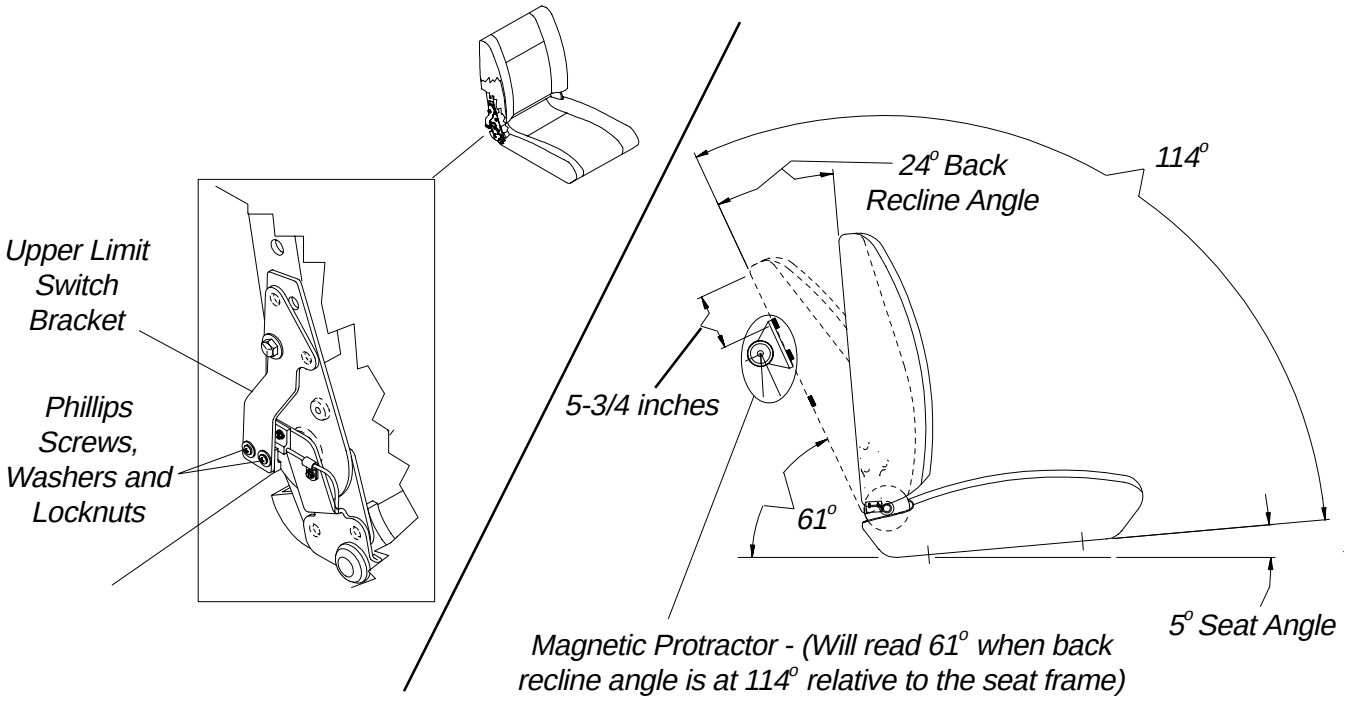

Upper Limit Switch Bracket
Phillips Screws, Washers and Locknuts
24° Back Recline Angle
114°
5-3/4 inches
61°
5° Seat Angle
Magnetic Protractor - (Will read 61° when back recline angle is at 114° relative to the seat frame)

FIGURE 2 - ADJUSTING LIMIT SWITCH

This Procedure Includes the Following:
Replacing Battery Box Retainer Bar/ Retainer Clip

WARNING

After ANY adjustments, repair or service and BEFORE use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

REPLACING BATTERY BOX RETAINER BAR/RETAINER CLIP (FIGURE 1)

1. Remove the battery box. Refer to INSTALLING/REMOVING GROUP 24 BATTERY BOXES in PROCEDURE 9 of this manual.

Replacing Retainer Clip

1. Remove the mounting screw that secures the retainer clip and shock (or rubber element) to the base frame.
2. Remove the existing retainer clip.
3. Position the NEW retainer clip between the shock (or rubber element) and the battery box sub-frame as shown in FIGURE 1. Make sure the angled end of the retainer clip is facing up.

WARNING

The Battery Box Retainer Bar/Retainer Clip MUST be fastened securely in place before using the wheelchair. Use Loctite 242 and torque to 160-inch pounds.

4. Reinstall the mounting screw that secures the retainer clip and shock (or rubber element) to the base frame. Use Loctite 242 and torque to 160-inch pounds.
5. Reinstall the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES - GROUP 24 BATTERY BASE FRAMES in PROCEDURE 9 of this manual.

Replacing Retainer Bar

1. Remove the two (2) mounting screws and spacers that secure the battery box retainer bar to the base frame.
2. Pull up on the battery box retainer bar to remove it from the base frame.
3. Install the two (2) existing spacers through the mounting holes in the **NEW** battery box retainer bar.

WARNING

The Battery Box Retainer Bar/Retainer Clip MUST be fastened securely in place before using the wheelchair. Use Loctite 242 and torque to 160-inch pounds.

4. Line up the NEW battery box retainer bar and spacers with the mounting holes in the battery box sub frame and the base frame.
5. Reinstall the mounting screws that secure the battery box retainer bar between battery box sub frame and the base frame. Use Loctite 242 and torque to 160-inch pounds.
6. Reinstall the both battery boxes. Refer to INSTALLING/REMOVING GROUP 24 BATTERY BOXES in PROCEDURE 9 of this manual.

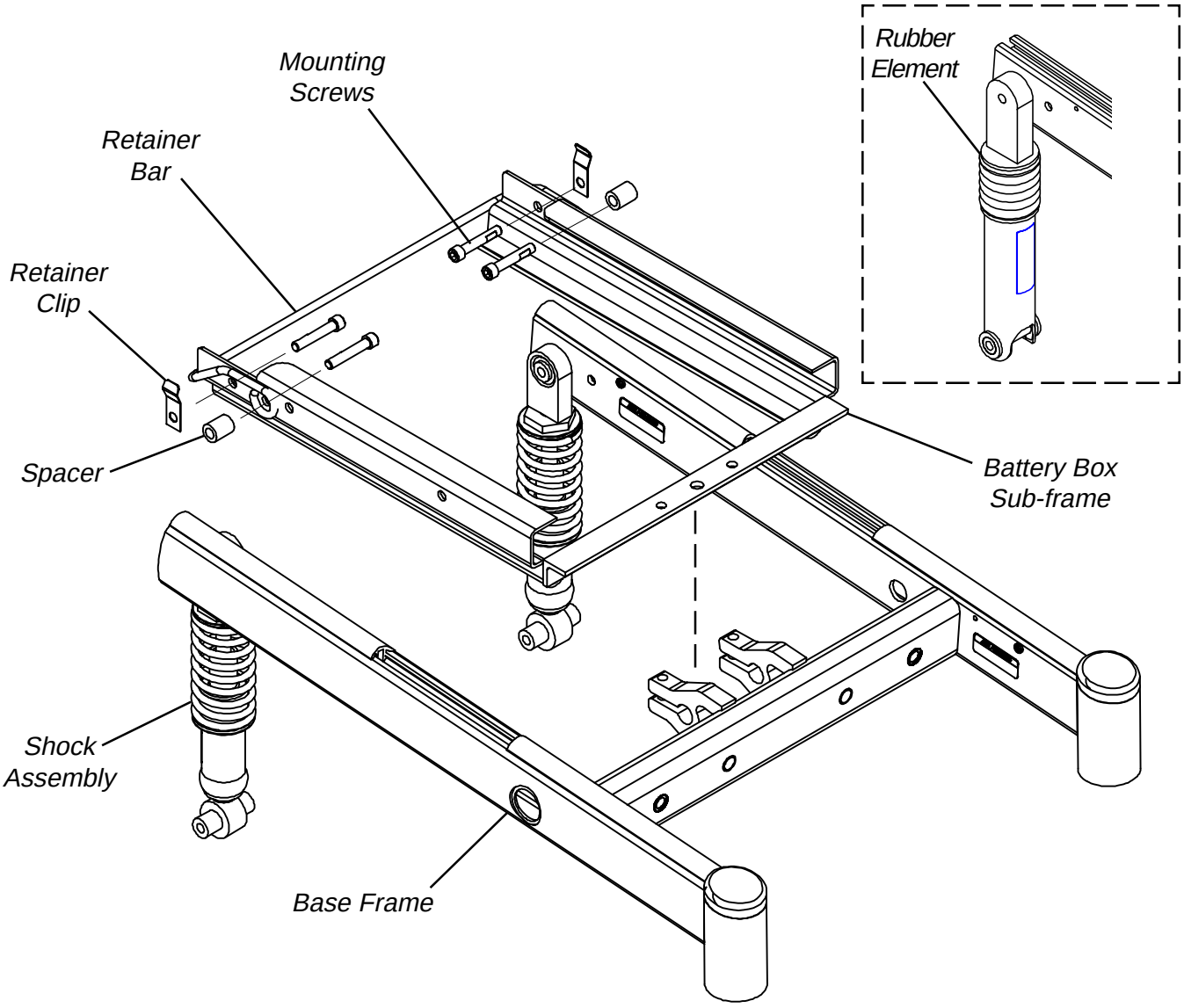


FIGURE 1 - REPLACING BATTERY BOX RETAINER BAR/RETAINER CLIP

This Procedure includes the following:
Replacing Pneumatic Tires/Tubes - Drive Wheels/ Casters
Removing/Installing Drive Wheels
Removing/Installing Drive Wheel Hub
Installing Wheel Lock Bracket onto Wheelchair
Removing/Installing Casters
Replacing Forks
Motor Replacement

WARNING

After ANY adjustments, repair or service and BEFORE use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

CAUTION

As with any vehicle, the wheels and tires should be checked periodically for cracks and wear and should be replaced.

REPLACING PNEUMATIC TIRES/ TUBES - DRIVE WHEELS/CASTERS

WARNING

DO NOT use your wheelchair unless it has the proper tire pressure (p.s.i.). DO NOT overinflate the tires. Failure to follow these suggestions may cause the tire to explode and cause bodily harm.

If tires are pneumatic, replacement of tire or tube MUST be performed by an authorized Invacare dealer or qualified technician.

NOTE: If drive wheels or casters are pneumatic, under-inflation causes excessive wear which results in poor performance of the tires.

REMOVING/INSTALLING DRIVE WHEELS (FIGURE 1)

CAUTION

Perform the following procedure in a designated work area to prevent damage to flooring (carpeting, tile, etc.).

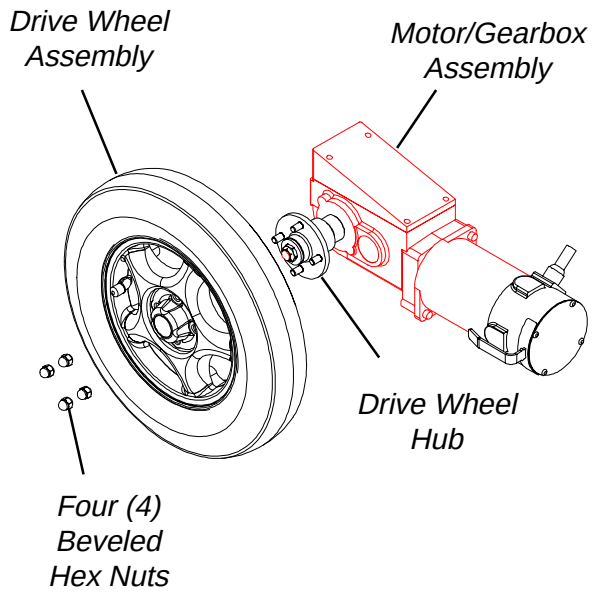
Removing

1. Remove the battery box(es). Refer to INSTALLING/REMOVING GROUP 24 BATTERY BOXES or INSTALLING/REMOVING GROUP 22 BATTERY BOXES in PROCEDURE 9 of this manual.
2. Remove the four (4) beveled hex nuts that secure the drive wheel assembly to the drive wheel hub assembly/ GB motor spacer.
3. Remove existing drive wheel assembly from wheel hub.

Installing

1. Reinstall new/existing drive wheel assembly to the wheel hub assembly and torque the four (4) beveled hex nuts to 160-inch pounds.
2. Repeat procedure for opposite side of wheelchair, if necessary.
3. Reinstall the battery box(es). Refer to INSTALLING/REMOVING GROUP 24 BATTERY BOXES or INSTALLING/REMOVING 22NF BATTERY BOXES in PROCEDURE 9 of this manual.

CONVENTIONAL MOTOR WITH GEARBOX



GEARLESS/BRUSHLESS MOTOR

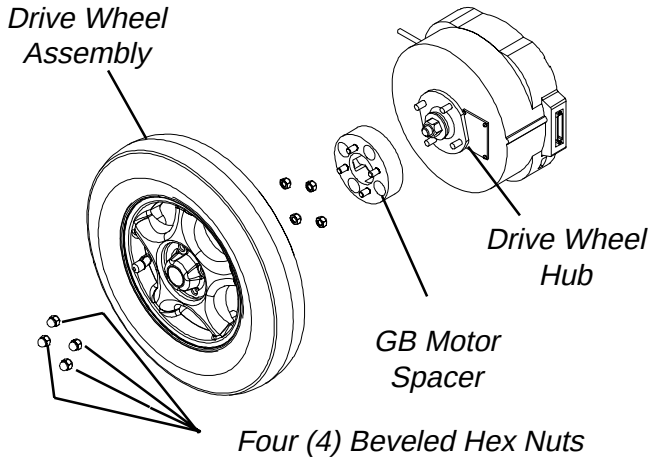


FIGURE 1 - REMOVING/INSTALLING DRIVE WHEELS AND DRIVE WHEEL HUB

REMOVING/INSTALLING DRIVE WHEEL HUB (FIGURE 2)

NOTE: This procedure can only be performed on 3G storm wheelchairs equipped with the conventional motor/gearbox assembly. On 3G storm wheelchairs equipped with the gearless/brushless motor, the drive wheel hub CANNOT be removed. Return motor to manufacturer for service.

Removing

1. Remove the drive wheel from the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in this procedure of the manual.
2. Remove the locknut, washer, keystock and existing drive wheel hub from the drive shaft of the motor/gearbox assembly.

Installing

1. Position the keystock on the drive shaft of the motor/gearbox assembly.

CAUTION

DO NOT apply more than a one (1)-inch (in length) thin film of anti-seize compound to the drive shaft. Applying more than one (1)-inch (in length) can cause the anti-seize compound to leak resulting in damage to flooring (carpet, tile, etc.).

2. Apply a thin film of anti-seize compound one (1) inch in length to the end of the drive shaft.
3. Reinstall drive wheel hub onto the drive shaft of the motor/gearbox assembly.

NOTE: While installing the drive wheel hub onto the drive shaft, spin the drive wheel hub to evenly distribute the anti-seize compound over the entire drive shaft.

4. Reinstall the washer and locknut and torque locknut to **45 foot pounds** (540-**inch pounds**).
5. Reinstall the drive wheel assembly to the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in this procedure of the manual.
6. Repeat procedure for the opposite side of the wheelchair, if necessary.

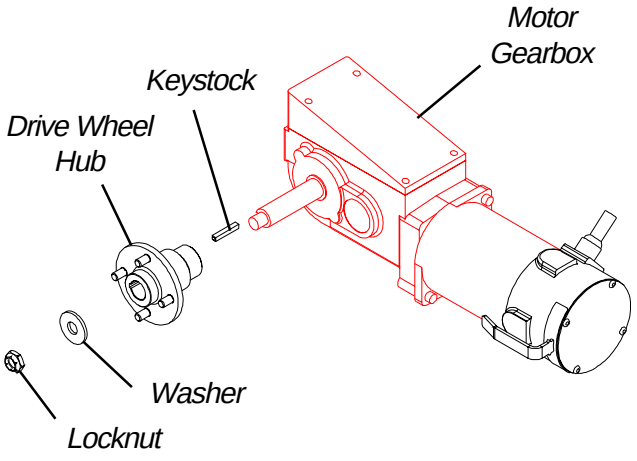


FIGURE 2 - REMOVING/INSTALLING DRIVE WHEEL HUB

INSTALLING WHEEL LOCK BRACKET ONTO WHEELCHAIR (FIGURE 3)

NOTE: This procedure only pertains to third generation storm wheelchairs with the conventional motor and gearbox. On third generation storm wheelchairs with the gearless/brushless motor, the wheel lock bracket is not required.

1. Remove the two (2) mounting screws closest to the large wheel that secure the gearbox to the suspension arm.
2. Line up mounting holes in the wheel lock mounting bracket with the gearbox mounting holes in the suspension arm.
3. Apply Loctite 242 to the two (2) mounting screws.
4. Reinstall the two (2) mounting screws into the mounting holes of the wheel lock mounting bracket and gear box and torque to 75-inch pounds.
5. Repeat STEPS 1-4 for opposite wheel lock bracket.
6. Adjust the wheel locks. Refer to ADJUSTING WHEEL LOCKS in PROCEDURE 9 of the owner's manual, 1081227.

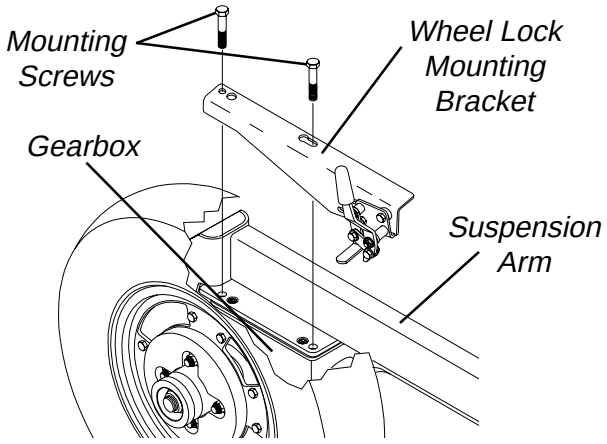


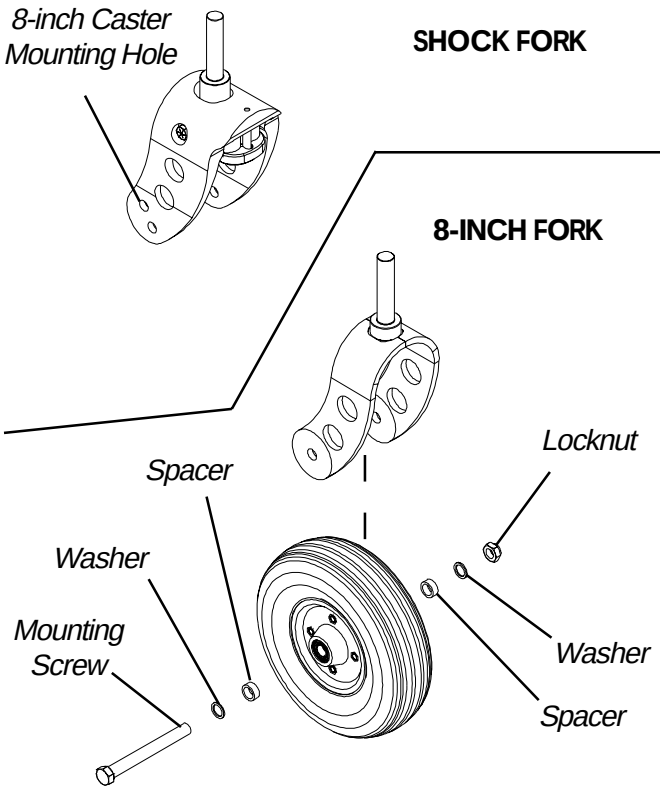
FIGURE 3 - INSTALLING WHEEL LOCK BRACKET ONTO WHEELCHAIR

REMOVING/INSTALLING CASTERS (FIGURE 4)

WARNING

DO NOT use your power wheelchair unless it has the proper tire pressure (p.s.i.). DO NOT over-inflate the tires. Failure to follow these suggestions may cause the tire to explode and cause bodily harm. The recommended tire pressure is listed on the side wall of the tire.

Periodically, the tires will need to be replaced due to wear or puncture.



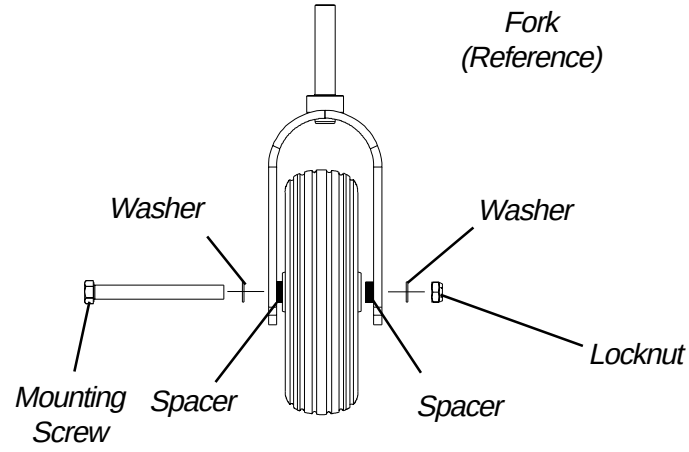


FIGURE 4 -REMOVING/INSTALLING CASTERS

Removing Casters

1. Remove the mounting screw, washers, spacers and locknut that secure the caster to the fork.
2. Remove the existing caster from the fork.

Installing Casters

1. Position the caster into the fork.
2. Reinstall the mounting screw, washers, spacers and locknut that secure the caster to the fork.
3. Torque locknut to 10-foot pounds (120-inch) pounds.
4. Loosen the locknut 1/8 of a turn.
5. Move the caster side to side.

NOTE: If the caster moves side to side, tighten the locknut slightly.

REPLACING FORKS (FIGURE 5)

1. Remove the caster from the existing fork. Refer to REMOVING/INSTALLING CASTERS in this procedure of the manual.
2. Remove the dust cover.
3. Remove the locknut, nylon washer, and spacer.
4. Drop the existing fork out of the caster head tube and spacer.
5. Slide the new fork into the spacer and caster head tube.

NOTE: Check bearing assemblies. Replace if necessary.

6. Ensure new fork slides completely into caster headtube.
7. Install spacer, nylon washer and secure with locknut.

WARNING

Improper positioning of the washer will prohibit the free movement of the forks.

8. Install the caster onto the new fork. Refer to REMOVING/INSTALLING CASTERS in this procedure of the manual.
9. Adjust the forks. Refer to ADJUSTING FORKS in PROCEDURE 9 of the owner's manual, 1081227

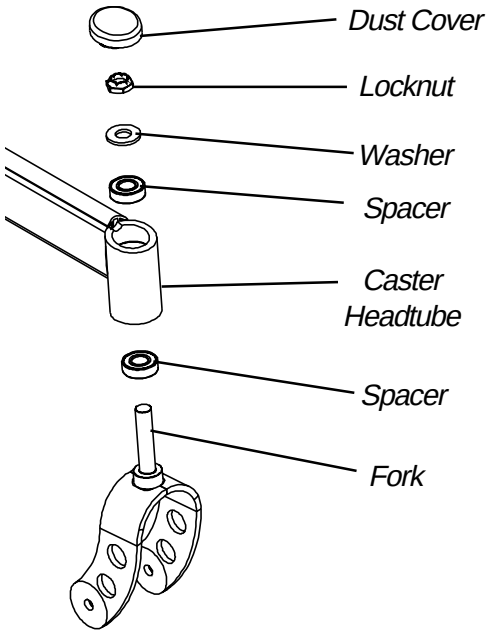


FIGURE 5 - REPLACING FORKS

REMOVING/INSTALLING THE MOTOR (CONVENTIONAL MOTOR WITH GEARBOX) (FIGURE 6)

Removing

1. Disconnect the right and/or left motor connector from the controller.
2. Remove the two (2) allen screws and washers that secure the motor to the gearbox.

CAUTION

DO NOT damage the motor/gearbox coupling.

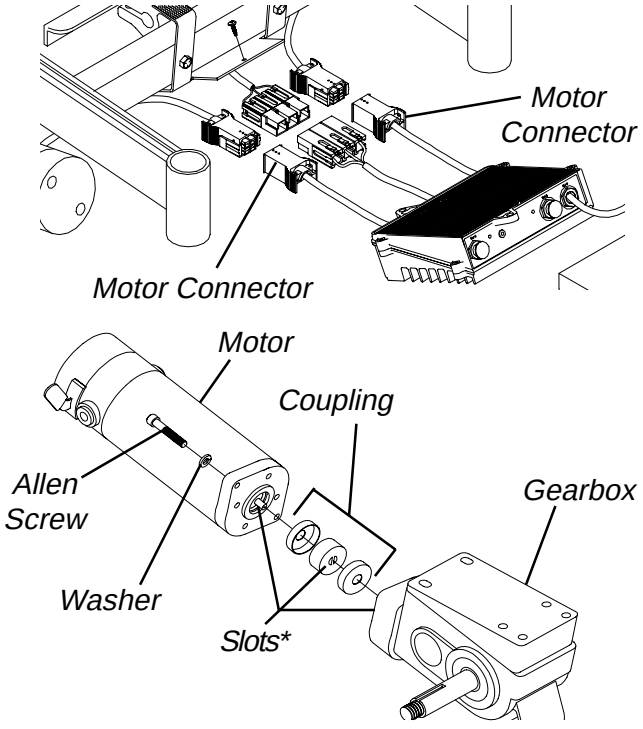
3. Carefully pull the motor away from the gearbox.

Installing

1. Perform the following:
   A. Inspect the coupling for wear and damage. If damage is evident, replace coupling.
   B. Install coupling onto gearbox input shaft inserting coupling drive plate onto slot on shaft.
   C. Carefully align motor and coupling and place motor against gearbox.
   D. With motor against gearbox, turn gearbox drive shaft until the coupler seats into gearbox.

   NOTE: When properly aligned, motor will be seated into gearbox.

   E. Install two (2) allen screws. Use Loctite 242, tighten allen screws evenly and then torque to 75-inch lbs.
2. Reconnect right/left motor connector to controller.



**NOTE: The slots on coupling of motor, the slots on the coupling and the slots on the gearbox must line up for proper installation*

FIGURE 6 - REMOVING/INSTALLING THE MOTOR - CONVENTIONAL MOTOR/GEARBOX FOR RWD, MWD AND FWD MODELS

REMOVING/INSTALLING THE MOTOR (GEARLESS/BRUSHLESS MOTOR) (FIGURE 7)

Removing

1. Remove the battery box(es). Refer to INSTALLING/REMOVING GROUP 24 BATTERY BOXES or INSTALLING/REMOVING GROUP 22 BATTERY BOXES in PROCEDURE 9 of this manual.
2. Unthread the mounting screws that secure the wiring harness connector to the motor.
3. Unplug the wiring harness connector from the motor.
4. If necessary, remove the group 22 battery box tray. Refer to REMOVING/INSTALLING 22NF BATTERY BOX TRAY in PROCEDURE 16 of this manual.
5. Remove the drive wheel from the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in this procedure of the manual.
6. Note the mounting position of the motor on the suspension arm before removing the motor.
7. Loosen adjustment screw that secures the motor lock lever in place on the brake release shaft.

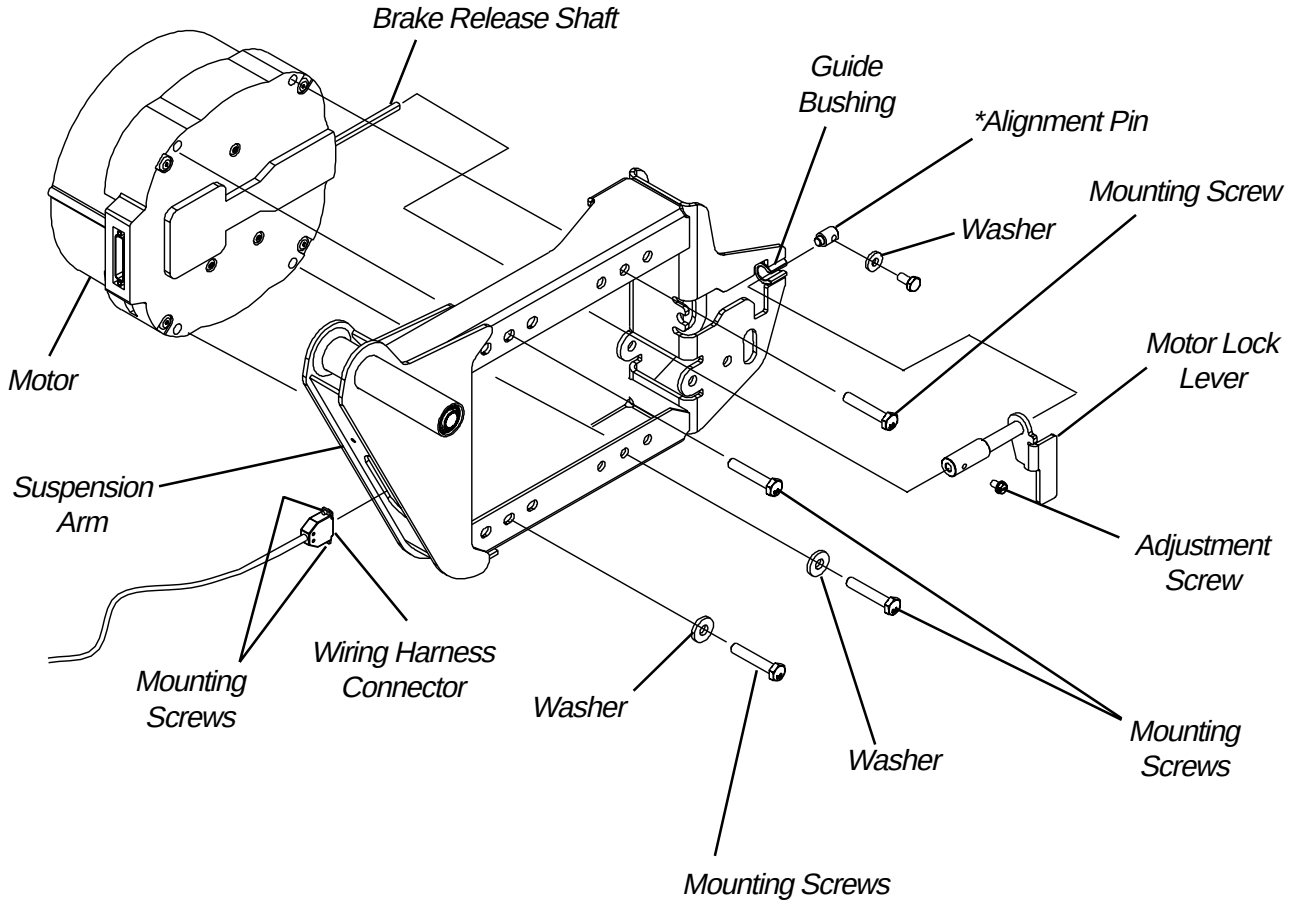
NOTE: Alignment pin is located inside of bushing guide on the suspension arm.

8. Remove the mounting screw and washer that secure the alignment pin in place.
9. Slide the alignment pin back out of the end of the motor lock lever.
10. Remove the four (4) mounting screws and washers that secure the motor to the suspension arm.
11. Remove motor with motor lock lever from suspension arm.
12. If replacing motor, remove the motor lock lever from the brake release shaft of the existing motor.

Installing

NOTE: Do not tighten adjustment screw of motor lock lever until motor is secured in place on the suspension arm.

1. If necessary, install motor lock lever onto new brake release shaft of motor.
2. Position the new/existing motor with motor lock lever onto the suspension arm in the mounting position noted from STEP 4 of REMOVING THE GEARLESS/BRUSHLESS MOTOR in this procedure of the manual.
3. Secure motor to the suspension arm with existing four (4) mounting screws. Torque to 13 foot/pounds.
4. Slide the motor lock lever along brake release shaft until the end is flush with the bushing guide.
5. Slide alignment pin, located inside of bushing guide, into the end of the motor lock lever and secure in place with existing mounting screw and washer. Securely tighten.
6. Secure motor lock lever in place on the brake release shaft with existing mounting screw.
7. Install the drive wheel from the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in this procedure of the manual.
8. If necessary, install the 22nf battery box tray. Refer to REMOVING/INSTALLING 22NF BATTERY BOX TRAY in PROCEDURE 16 of this manual.
9. Plug the wiring harness connector into the motor.
10. Secure the wiring harness connector to the motor with the existing two (2) mounting screws.
11. Remove the battery box(es). Refer to INSTALLING/REMOVING GROUP 24 BATTERY BOXES or INSTALLING/REMOVING 22NF BATTERY BOXES in PROCEDURE 9 of this manual.



*NOTE: Alignment pin exploded away suspension arm for clarification purposes only.

FIGURE 7 - REMOVING/INSTALLING MOTOR - GEARLESS/BRUSHLESS

This Procedure Includes the Following:
Repositioning MKIV Joystick - Van Seat Models *Removing/Installing MKIV Controller*

WARNING

After ANY adjustments, repair or service and BEFORE use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

REPOSITIONING MKIV JOYSTICK - VAN SEAT MODELS (FIGURE 1)

1. Turn the lever on the adjustment lock to release the adjustment lock from joystick mounting tube.
2. Remove the joystick mounting tube from wheelchair.
3. Remove the three (3) hex bolts, spacers and locknuts that secure joystick mounting bracket to armrest plate.
4. Remove the phillips screws that secures the front of the armrest pad to the armrest plate.
5. Remove the phillips screw that secures the rear of the armrest pad and armrest insert to the armrest plate.
6. Remove the armrest pad from the armrest plate.
7. Remove the lug bolt, washers and locknut that secure the existing armrest plate to the armrest weldment.
8. Repeat STEPS 4-7 for opposite side of the wheelchair.
9. Position armrest plate with joystick mounting holes on desired side of armrest weldment and secure with lug bolt, washers and locknut. Refer to FIGURE 1 for correct hardware orientation.
10. Position armrest plate without joystick mounting holes on opposite side of the armrest weldment and secure with lug bolt, washers and locknut. Refer to FIGURE 1 for correct hardware orientation.

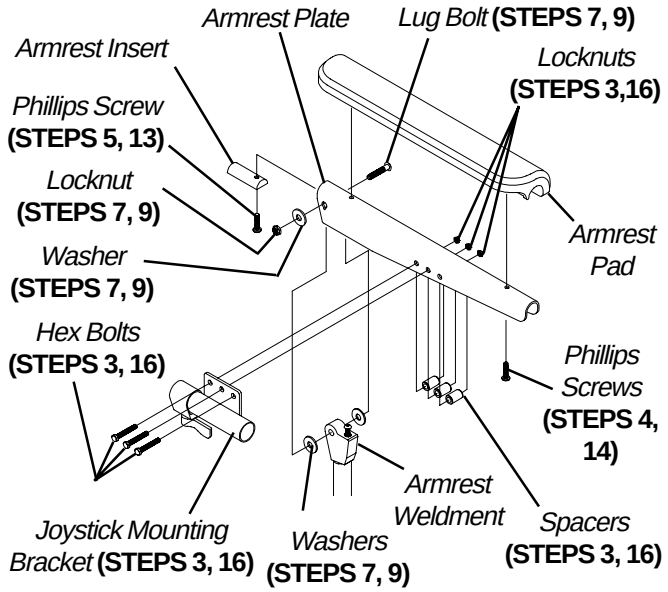


FIGURE 1 - REPOSITIONING MKIV JOYSTICK - VAN SEAT MODELS

REMOVING/INSTALLING THE MKIV CONTROLLER

Removing MKIV Controller (Wheelchairs Equipped with Non-Powered Seating Systems) (FIGURE 8)

1. Remove the battery boxes. Refer to REMOVING/INSTALLING THE BATTERY BOXES in the Owner's Manual, part number 1081227.
2. Remove the controller shroud (if applicable). Refer to REMOVING/INSTALLING THE SHROUD in the Owner's Manual, part number 1081227.
3. Remove the 5/16-18 x 1-inch hex head cap screw that secures the controller bracket and and jumper cable to the base frame.
4. Remove the 5/16-18 x 1-inch hex head cap screw that secures the controller bracket to the base frame.
5. Remove the 8-32 x 1/2-inch mounting screw and lockwasher that secures the front of the MKIV controller and jumper cable to the controller bracket.
6. Remove the two (2) 8-32 x 1/2-inch mounting screws that secure the rear of the MKIV controller to the controller bracket.

Installing MKIV Controller (Wheelchairs Equipped with Non-Powered Seating Systems)(FIGURE 8)

1. Secure the rear of the MKIV controller to the controller bracket with two (2) of the NEW 8-32 x 1/2-inch mounting screws. Securely tighten.
2. Secure the front of the MKIV controller and one end of the jumper cable to the controller bracket with one (1) of the NEW 8-32 x 1/2-inch mounting screw and lockwasher. Securely tighten.
3. Secure one side of the controller bracket to the base frame as shown in FIGURE 2 with one (1) of the NEW 5/16-18 x 1-inch hex head cap screw. Securely tighten.
4. Secure the other side of the controller bracket and opposite end of jumper cable to the base frame as shown in FIGURE 2 with the remaining NEW 5/16-18 x 1-inch hex head cap screw. Securely tighten.
5. Reinstall the controller shroud (if applicable). Refer to REMOVING/INSTALLING THE SHROUD in the Owner's Manual, part number 1081227.
6. Reinstall the battery boxes. Refer to REMOVING/INSTALLING THE BATTERY BOXES in the Owner's Manual, part number 1081227.

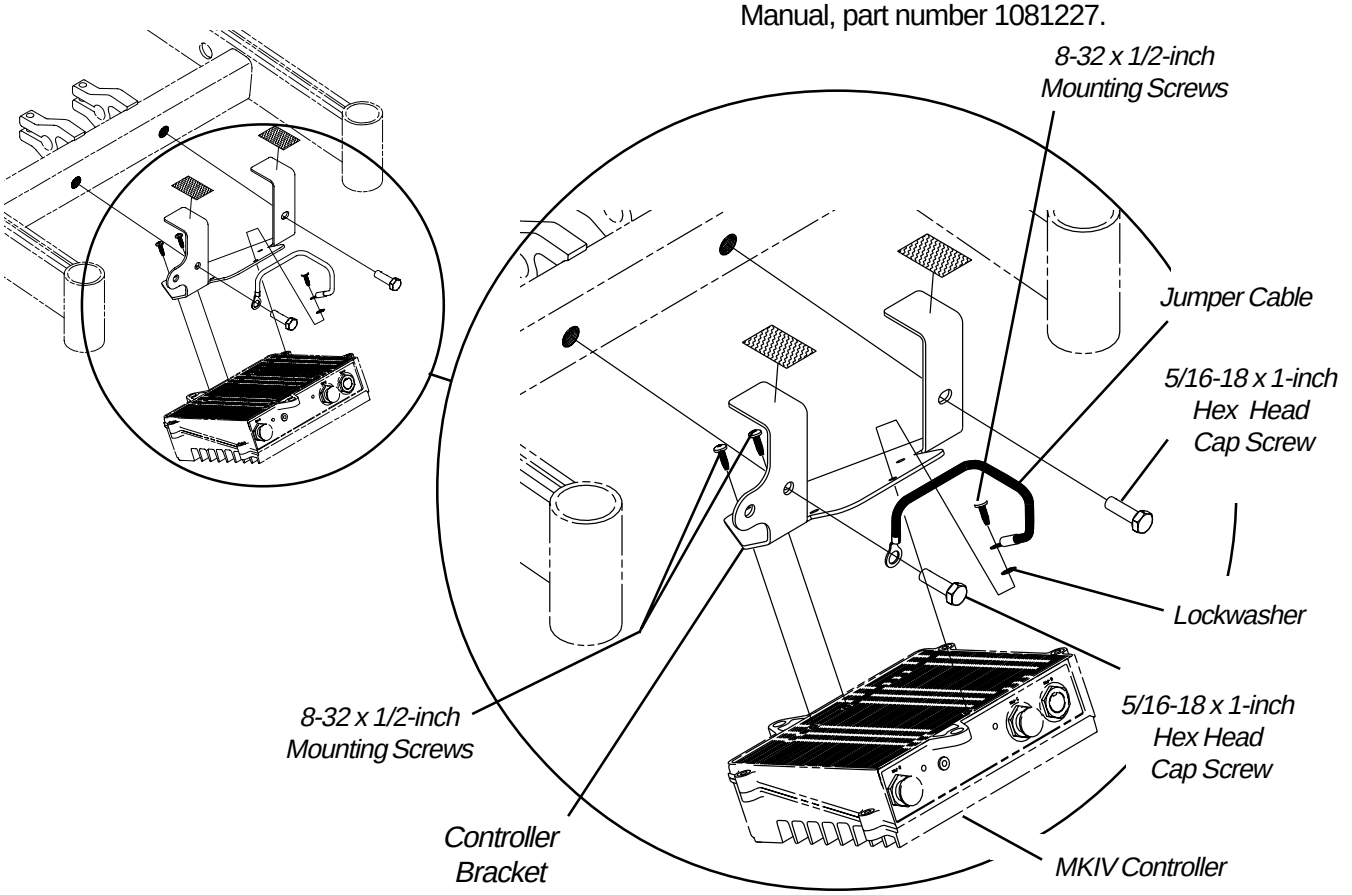


FIGURE 8 - REMOVING/INSTALLIN G THE MKIV CONTROLLER (WHEELCHAIRS EQUIPPED WITH NON-POWERED SEATING SYSTEMS)

Removing GB Controller (Wheelchairs Equipped with Non-Powered Seating Systems) (FIGURE 9)

1. Remove the battery boxes. Refer to REMOVING/INSTALLING THE BATTERY BOXES in the Owner's Manual, part number 1081227.
2. Remove the controller shroud (if applicable). Refer to REMOVING/INSTALLING THE SHROUD in the Owner's Manual, part number 1081227.
3. Remove the 5/16-18 x 1-inch hex head cap screw that secures the controller bracket and jumper cable to the base frame.
4. Remove the 5/16-18 x 1-inch hex head cap screw that secures the controller bracket to the base frame.
5. Remove the 10-32 x 1/2-inch mounting screw and ltwo (2) ockwashers that secures the front of the GB controller and jumper cable to the controller bracket.
6. Remove the two (2) 10-32 x 1/2-inch mounting screws that secure the rear of the GB controller to the controller bracket.

Installing G/B Controller (Wheelchairs Equipped with Non-Powered Seating Systems) (FIGURE 9)

1. Secure the rear of the GB controller to the controller bracket with two (2) of the NEW 10-32 x 1/2-inch mounting screws. Securely tighten.
2. Secure the front of the GB controller and one end of the jumper cable to the controller bracket with one (1) of the NEW 10-32 x 1/2-inch mounting screw and two (2) lockwashers. Securely tighten.
3. Secure one side of the controller bracket to the base frame as shown in FIGURE 2 with one (1) of the NEW 5/16-18 x 1-inch hex head cap screws. Securely tighten.
4. Secure the other side of the controller bracket and opposite end of jumper cable to the base frame as shown in FIGURE 2 of the remaining NEW 5/16-18 x 1-inch hex head cap screws. Securely tighten.
5. Reinstall the controller shroud (if applicable). Refer to REMOVING/INSTALLING THE SHROUD in the Owner's Manual, part number 1081227.
6. Reinstall the battery boxes. Refer to REMOVING/INSTALLING THE BATTERY BOXES in the Owner's Manual, part number 1081227.

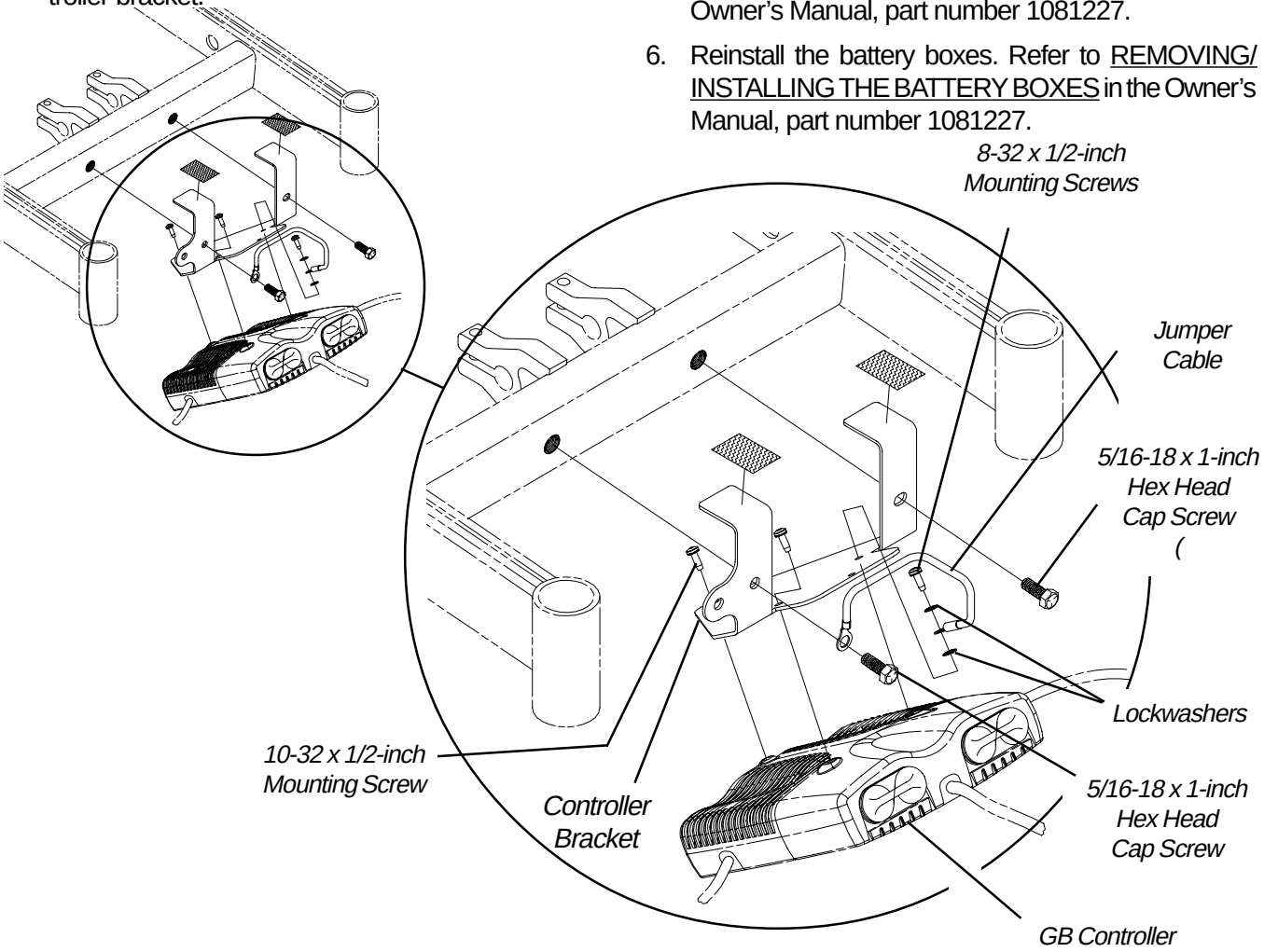


FIGURE 9 - REMOVING/INSTALLIN G THE GB CONTROLLER (WHEELCHAIRS EQUIPPED WITH NON-POWERED SEATING SYSTEMS)

Removing MKIV Controller (Wheelchairs Equipped with 2nd generation Powered Seating Systems) (FIGURE 10)

1. Remove the battery boxes. Refer to REMOVING/INSTALLING THE BATTERY BOXES in the Owner's Manual, part number 1081227.
2. Remove the controller shroud (if applicable). Refer to REMOVING/INSTALLING THE SHROUD in the Owner's Manual, part number 1081227.
3. Remove the TRCM controller (if applicable). Refer to REPLACING THE TILT AND RECLINE CONTROL MODULE (TRCM) in Tilt and Recline Service Manual, part number 1090208.
4. Remove the 5/16-18 x 1-inch hex head cap screw that secures the jumper cable and controller bracket to the base frame.
5. Remove the 5/16-18 x 1-inch hex head cap screw that secures the controller bracket to the base frame.
6. Remove the 8-32 x 1/2-inch mounting screw and lockwasher that secures the front of the MKIV controller and jumper cable to the controller bracket.
7. Remove the two (2) 8-32 x 1/2-inch mounting screws that secure the rear of the MKIV controller to the controller bracket.

Installing MKIV Controller (Wheelchairs Equipped with 2nd generation Powered Seating Systems) (FIGURE 10)

1. Secure the rear of the MKIV controller to the controller bracket with two (2) of the NEW 8-32 x 1/2-inch mounting screws. Securely tighten.
2. Secure the front of the MKIV controller and one end of the jumper cable to the controller bracket with one (1) of the NEW 8-32 x 1/2-inch mounting screw and lockwasher. Securely tighten.
3. Secure one side of the controller bracket to the base frame as shown in FIGURE 6 with one (1) of the NEW 5/16-18 x 1-inch hex head cap screw. Securely tighten.
4. Secure the other side of the controller bracket and opposite end of jumper cable to the base frame as shown in FIGURE 6 with one (1) of the NEW 5/16-18 x 1-inch hex head cap screw. Securely tighten.
5. Reinstall the TRCM controller (if applicable). Refer to REPLACING THE TILT AND RECLINE CONTROL MODULE (TRCM) in Tilt and Recline Service Manual, part number 1090208.
6. Reinstall the controller shroud (if applicable). Refer to REMOVING/INSTALLING THE SHROUD in the Owner's Manual, part number 1081227.
7. Reinstall the battery boxes. Refer to REMOVING/INSTALLING THE BATTERY BOXES in the Owner's Manual, part number 1081227.

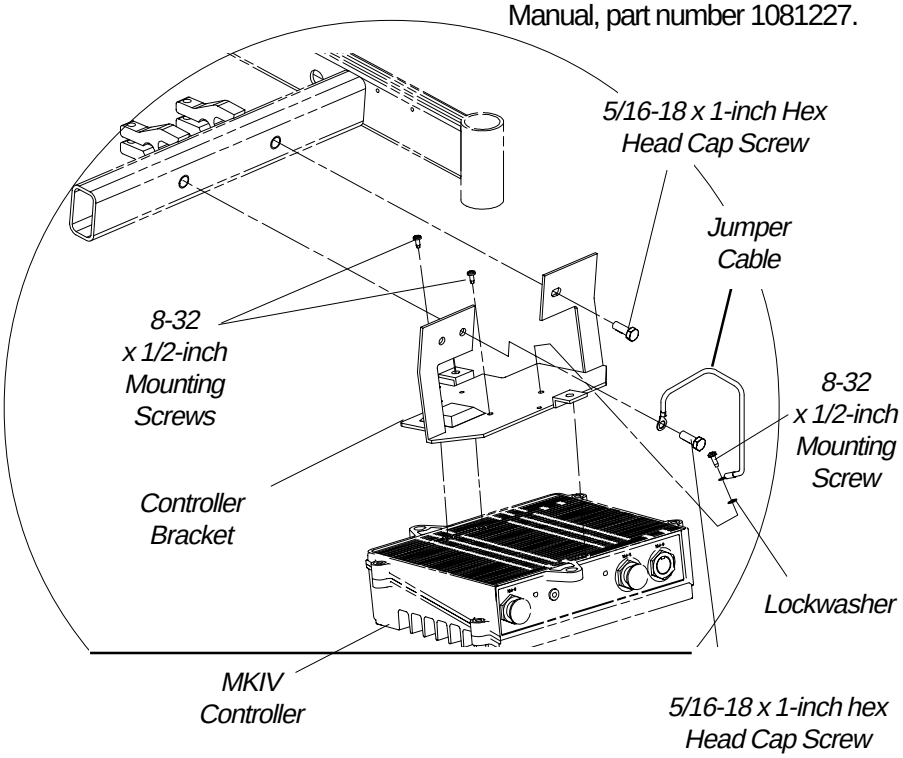


FIGURE 10 - REMOVING/INSTALLIN G THE MKIV CONTROLLER (WHEELCHAIRS EQUIPPED WITH 2ND GENERATION POWERED SEATING SYSTEM)

Removing GB Controller (Wheelchairs Equipped with 2nd generation Powered Seating Systems) (FIGURE 11)

1. Remove the battery boxes. Refer to REMOVING/INSTALLING THE BATTERY BOXES in the Owner's Manual, part number 1081227.
2. Remove the controller shroud (if applicable). Refer to REMOVING/INSTALLING THE SHROUD in the Owner's Manual, part number 1081227.
3. Remove the TRCM controller (if applicable). Refer to REPLACING THE TILT AND RECLINE CONTROL MODULE (TRCM) in Tilt and Recline Service Manual, part number 1090208.
4. Remove the 5/16-18 x 1-inch hex head cap screw that secures the jumper cable and controller bracket to the base frame.
5. Remove the 5/16-18 x 1-inch hex head cap screw that secures the controller bracket to the base frame.
6. Remove the 10-32 x 1/2-inch mounting screw and two (2) lockwashers that secures the front of the GB controller and jumper cable to the controller bracket.
7. Remove the two (2) 8-32 x 1/2-inch mounting screws that secure the rear of the GB controller to the controller bracket.

Installing GB Controller (Wheelchairs Equipped with 2nd generation Powered Seating Systems) (FIGURE 11)

1. Secure the rear of the GB controller to the controller bracket with two (2) of the NEW 10-32 x 1/2-inch mounting screws. Securely tighten.
2. Secure the front of the GB controller and one end of the jumper cable to the controller bracket with one (1) of the NEW 10-32 x 1/2-inch mounting screw and lockwasher. Securely tighten.
3. Secure one side of the controller bracket to the base frame with one (1) of the NEW 5/16-18 x 1-inch hex head cap screws. Securely tighten.
4. Secure the other side of the controller bracket and opposite end of jumper cable to the base frame one (1) of the NEW 5/16-18 x 1-inch hex head cap screws. Securely tighten.
5. Reinstall the TRCM controller (if applicable). Refer to REPLACING THE TILT AND RECLINE CONTROL MODULE (TRCM) in Tilt and Recline Service Manual, part number 1090208.
6. Reinstall the controller shroud (if applicable). Refer to REMOVING/INSTALLING THE SHROUD in the Owner's Manual, part number 1081227.
7. Reinstall the battery boxes. Refer to REMOVING/INSTALLING THE BATTERY BOXES in the Owner's Manual, part number 1081227.

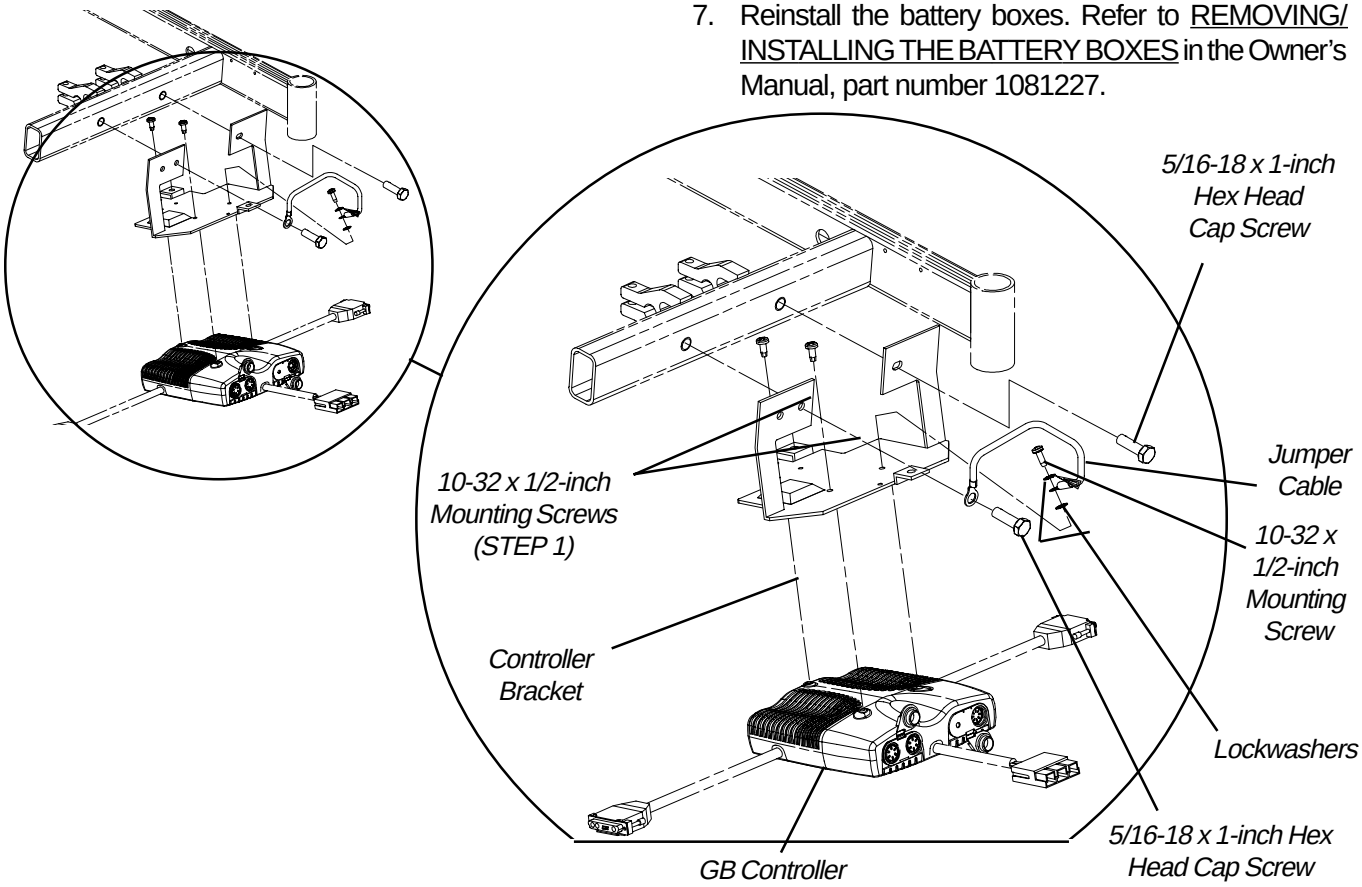

5/16-18 x 1-inch Hex Head Cap Screw
Jumper Cable
10-32 x 1/2-inch Mounting Screws (STEP 1)
10-32 x 1/2-inch Mounting Screw
Controller Bracket
Lockwashers
5/16-18 x 1-inch Hex Head Cap Screw
GB Controller

FIGURE 11 - REMOVING/INSTALLING THE GB CONTROLLER (WHEELCHAIRS EQUIPPED WITH 2ND GENERATION POWERED SEATING SYSTEM)

This Procedure Includes the Following:

Positioning Limit Switch

Adjusting Limit Switch

Replacing Recliner Cable Assemblies

Replacing/Adjusting Gas Cylinders

Changing Back Height

Changing Seat Depth

Changing Seat Width

Installing/Replacing Adjustable 16 to 19-inch Deep Recliner Seat Frame onto Arrow or X Base

WARNING

After ANY adjustments, repair or service and BEFORE use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

POSITIONING LIMIT SWITCH (FIGURE 1)

NOTE: The battery charger connector, as well as, the limit switch are factory set on the RIGHT side of the wheelchair. However, they can be positioned on either side for user convenience. The limit switch MUST BE positioned on the same side as the battery charger connector.

1. Cut the two (2) tie wraps that secure the limit switch wire to the seat frame.
2. Remove the two (2) mounting screws and washers that secure the actuator to the gas cylinder pivot block.
3. Position actuator on opposite gas cylinder pivot block.

CAUTION

DO NOT over tighten the mounting screws that secure the actuator to the pivot block. Damage to actuator will occur.

4. Secure the actuator to the pivot block with the two (2) mounting screws and washers. DO NOT overtighten.
5. Remove the mounting screw that secures the wire retainer to the inside of the seat frame.
6. Remove the two (2) mounting screws and washers that secure the limit switch sensor to the seat frame.
7. Turn limit switch sensor over so opposite side is facing up and the wire is on the INSIDE of the seat frame.
8. Position the limit switch sensor onto the opposite side of the seat frame.

CAUTION

DO NOT over tighten the mounting screws that secure the limit switch sensor to the seat frame. Damage to the limit switch sensor will occur.

9. Secure limit switch sensor to the seat frame with the two (2) mounting screws and washers.
10. Secure the wire retainer onto the INSIDE of the seat frame with the mounting screw.
11. Tie wrap the limit switch wire to the seat frame.
12. Adjust the limit switch. Refer to ADJUSTING LIMIT SWITCH in this procedure of the manual.

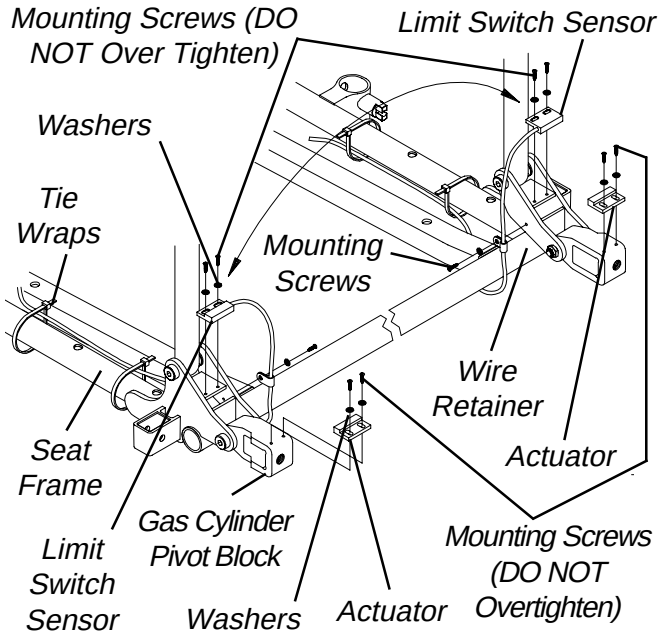


FIGURE 1 - POSITIONING LIMIT SWITCH

ADJUSTING LIMIT SWITCH (FIGURE 2)

WARNING

NEVER operate the wheelchair while in any recline position over 105° RELATIVE TO THE SEAT FRAME. If the limit switch does not stop the wheelchair from operating in a recline position greater than 105° RELATIVE TO THE SEAT FRAME, do not operate the wheelchair. Adjust the limit switch BEFORE using the wheelchair, otherwise injury or damage can occur.

1. Recline the back of the wheelchair until the gas cylinder rod measures 3-21/32 of an inch.
2. Turn the power of the joystick to the ON position.

NOTE: ALL segments of the bar graph on the joystick should start to flash on and off and the wheelchair should not operate.

3. **IF** the wheelchair operates, proceed to the following steps to adjust the actuator on the gas cylinder pivot block:
   A. Loosen, but do not remove, the two (2) mounting screws and washers that secure the actuator to the gas cylinder pivot block.

B. Slide actuator UP (towards top of the wheelchair).

CAUTION

DO NOT over tighten the mounting screws that secure the actuator to the pivot block. Damage to the actuator will occur.

C. Only tighten the two (2) mounting screws and washers that secure the actuator to the gas cylinder pivot block until the actuator does not move.

D. Repeat STEPS 1 and 2 until the wheelchair does not operate when the gas cylinder rod is 3-21/32-inch long.

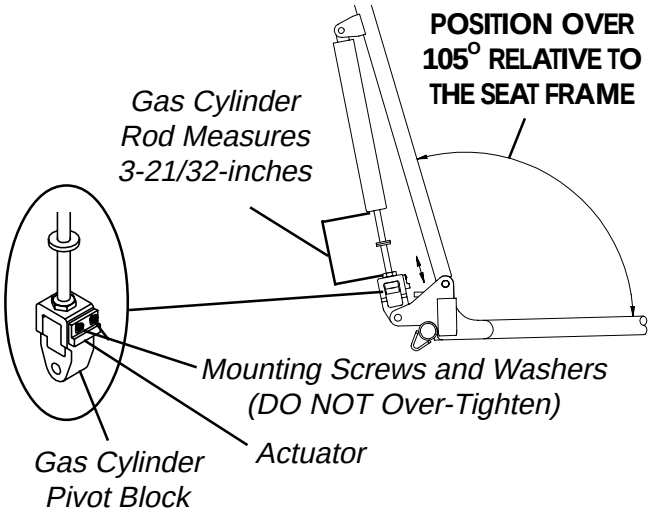

POSITION OVER 105° RELATIVE TO THE SEAT FRAME
Gas Cylinder Rod Measures 3-21/32-inches
Mounting Screws and Washers (DO NOT Over-Tighten)
Actuator
Gas Cylinder Pivot Block

FIGURE 2 - ADJUSTING LIMIT SWITCH

REPLACING RECLINER CABLE ASSEMBLIES (FIGURE 3)

NOTE: There are three (3) different cable lengths depending on back height:

CABLE LENGTH	BACK HEIGHT
Short	18-1/2 and 20-inches
Medium	22 and 24-inches
Long	26-inches

WARNING

Replace ONE (1) recliner cable assembly at a time to avoid injury.

1. Cut the tie wraps that secure the existing recliner cable assembly to the back cane.
2. Remove the pan screw that secures the handle of the existing recliner cable assembly to the back cane.
3. Loosen the jam nut on the gas cylinder rod.
4. Remove the mounting screw, washer, nylon washers and locknut that secure the TOP of the gas cylinder to the mounting bracket on the back cane.
5. Unscrew the gas cylinder from the operator of the existing recliner cable assembly but do not remove the gas cylinder from the pivot block.
6. Remove the operator of the existing recliner cable assembly from the pivot block.
7. Make sure the threads of the gas cylinder rod are flush with the inside of the pivot block.
8. With the operator of the NEW recliner cable assembly on the inside of the recliner seat frame, line up the mounting hole in the operator of the new recliner cable assembly with the gas cylinder rod.

CAUTION

DO NOT force the gas cylinder rod into the operator of the recliner cable assembly.

DO NOT cross thread the operator of the recliner cable assembly with the gas cylinder.

If slack in the recliner cable or movement in the operator of the cable assembly can not be eliminated, DO NOT use the recliner cable assembly.

9. Screw the NEW gas cylinder into the operator of the cable assembly until the jam nut sits on the pivot block, there is no slack in the recliner cable and there is no movement in the operator of the recliner cable assembly.

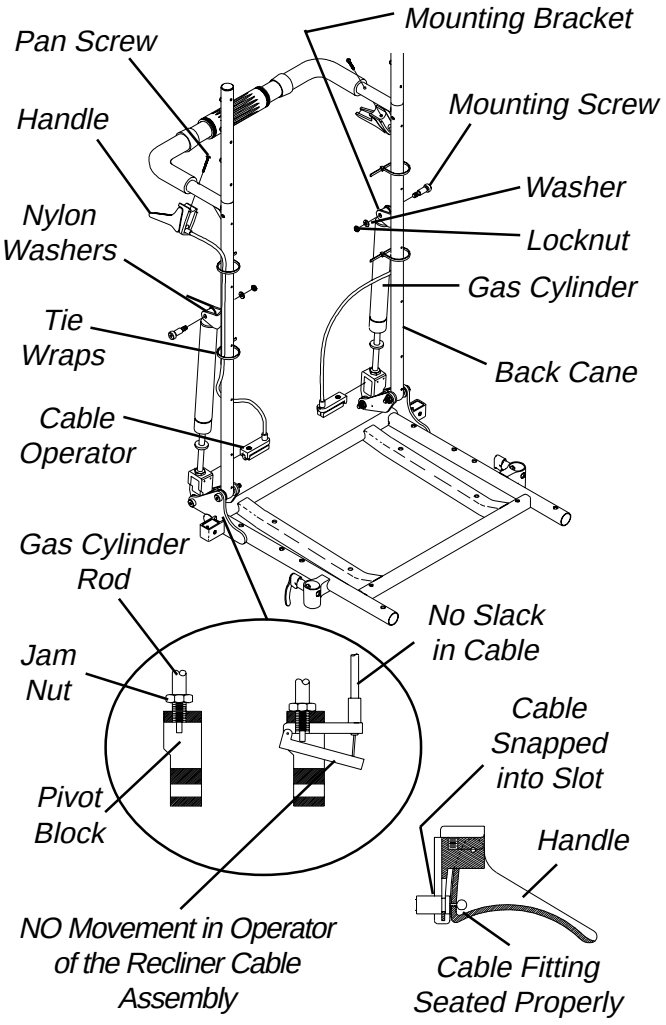


FIGURE 3 - REPLACING RECLINER CABLE ASSEMBLIES

10. Visually inspect the handle to make sure that the cable is snapped completely into slot in handle and cable fitting is seat properly in the handle.
11. Reinstall the mounting screw through the mounting bracket of the back cane, nylon washer, gas cylinder, nylon washer, mounting bracket and washer and securely tighten with the existing locknut. Torque to 75-inch pounds.
12. Line up the mounting hole in the handle of the recliner cable assembly with the mounting hole in the back cane.
13. Insert the pan screw through the handle of the recliner cable assembly and the back cane and torque to 9-inch pounds.
14. Tie wrap the recliner cable assembly to the recliner back cane.
15. Adjust the gas cylinder. Refer to ADJUSTING GAS CYLINDERS in this procedure of the manual.

REPLACING/ADJUSTING GAS CYLINDERS (FIGURE 4)

WARNING

Replace ONE (1) gas cylinder at a time to avoid injury.

Both gas cylinders MUST be operational and adjusted properly BEFORE using the recliner. DO NOT operate the recliner if only one (1) of the gas cylinders is operational or adjusted properly.

Replacing Gas Cylinder

1. Remove the mounting screw, washer, nylon washers and locknut that secure the TOP of the gas cylinder to mounting bracket on back cane.
2. Loosen the jam nut on existing gas cylinder rod.
3. Unscrew the existing gas cylinder from the operator of the recliner cable assembly and the pivot block and remove the existing gas cylinder from the wheelchair.
4. Screw cylinder rod of the NEW gas cylinder into the pivot block until the threads of the cylinder rod are flush with inside of pivot block (FIGURE 4).
5. With the operator of the recliner cable assembly on the inside of the recliner seat frame, line up the mounting hole in the operator of the recliner cable assembly with the new gas cylinder rod.

CAUTION

DO NOT force the gas cylinder rod into the operator of the recliner cable assembly.

DO NOT cross thread the operator of the recliner cable assembly with the gas cylinder.

If slack in the recliner cable or movement in the operator of the cable assembly can not be eliminated, DO NOT use the recliner cable assembly.

6. Screw the NEW gas cylinder into the operator of the cable assembly until the jam nut sits on the pivot block, there is no slack in recliner cable and there is no movement in the operator of the recliner cable assembly.
7. Visually inspect the handle to make sure that the cable is snapped completely into slot in handle and cable fitting is seat properly in the handle.
8. Press the operator of the recliner cable assembly to extend the NEW gas cylinder.
9. Line up the mounting holes of the NEW gas cylinder and the bracket of the back cane.
10. Reinstall the mounting screw through the mounting bracket of the back cane, nylon washer, NEW gas cylinder, nylon washer, mounting bracket and washer and securely tighten with the existing locknut. Torque to 75-inch pounds.
11. Adjust the NEW gas cylinders. Refer to ADJUSTING GAS CYLINDERS in this procedure of the manual.

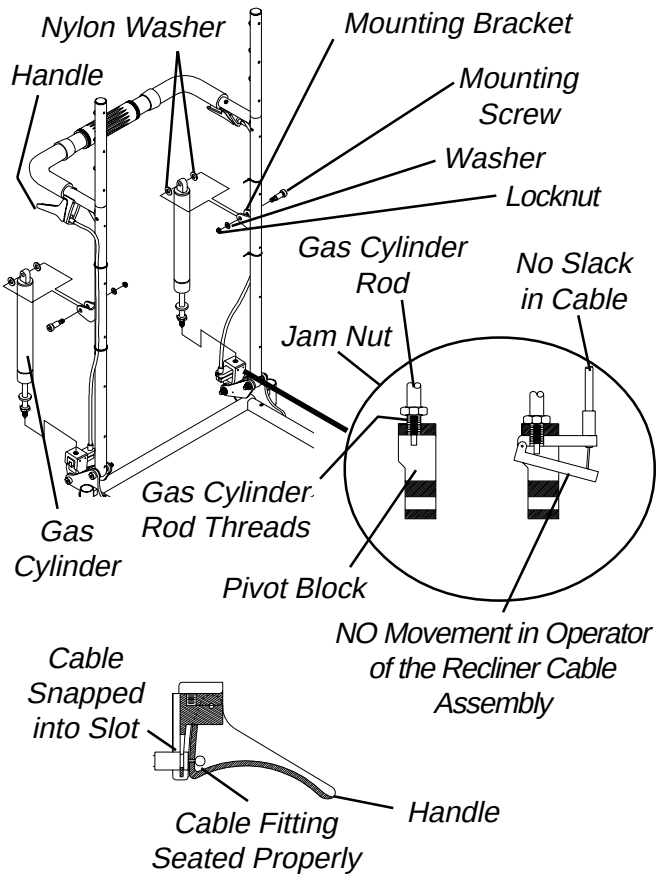


FIGURE 4 - REPLACING/ADJUSTING GAS CYLINDERS

Adjusting Gas Cylinder

1. To adjust the **LEFT** gas cylinder: Squeeze the handle of the **RIGHT** recliner cable assembly and try to recline the back. The back should not recline.
2. If the **LEFT** side of the back releases without squeezing the handle of the **LEFT** recliner cable assembly, perform the following steps:
   A. Finger tighten the jam nut on the rod of the gas cylinder until it bottoms out on the rod of the cylinder (**FIGURE 4**).
   B. Turn the jam nut on the **LEFT** gas cylinder **COUNTERCLOCKWISE** approximately one-half (1/2) revolution.

NOTE: The gas cylinder rod will turn.

   C. Repeat **STEP 1**.
   D. Repeat **STEP B** until the **LEFT** side of the back **DOES NOT** recline.
3. To adjust the RIGHT gas cylinder: Repeat **STEPS 1** and **2** for the **LEFT** handle of the cable assembly.

CAUTION

Damage to the gas cylinder rod WILL occur if the following steps are NOT followed when the jam nut is torqued against the pivot block.

4. Using **NO LARGER** than 1/4-inch wide, fine toothed pliers, wrap masking tape around the teeth of the pliers two (2) or (3) revolutions.
5. Using **NO** excessive force, hold the gas cylinder rod just above the jam nut.
6. While holding the gas cylinder rod and using a 17mm wrench, turn the jam nut **CLOCKWISE** and torque the **RIGHT** and **LEFT** jam nuts against the **RIGHT** and **LEFT** pivot blocks to 156-inch pounds.

CHANGING BACK HEIGHT (FIGURE 5)

1. Press the push pins on the headrest extension tubes in and remove headrest extension from back canes.
2. Remove the recliner cables from the back canes. Refer to REPLACING RECLINER CABLE ASSEMBLIES in this procedure of the manual.
3. Remove the mounting screws, washers and locknuts that secure the TOP of the gas cylinders to the mounting bracket on the back canes.
4. Remove the mounting screws, washers and locknuts that secure the back canes to the seat frame.
5. Remove the existing recliner back assembly from the wheelchair.
6. Turn the spreader bar on the existing back canes **CLOCKWISE** (toward back upholstery) and remove the spreader bar from the existing back canes.
7. Loosely install the spreader bar onto the NEW back cane handles by rotating the spreader bar **COUNTERCLOCKWISE** (away from the back canes).

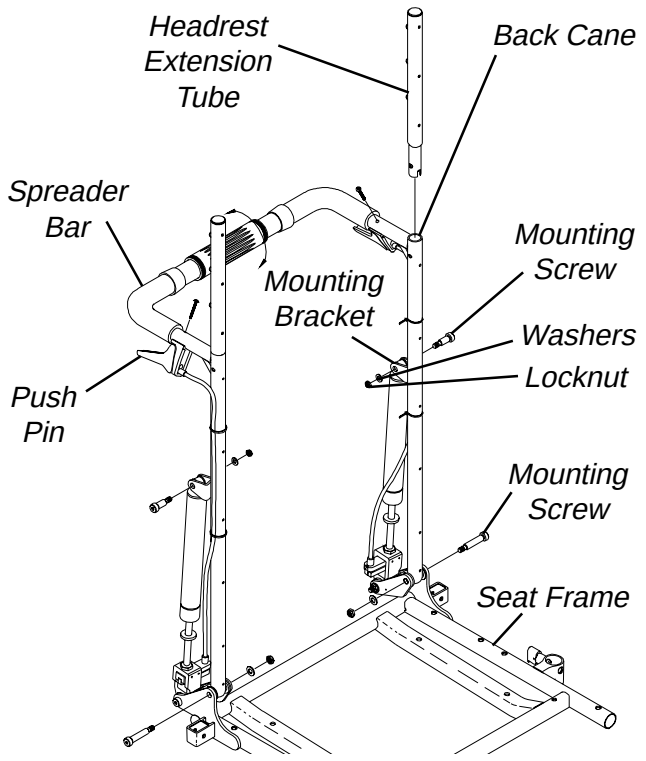
NOTE: If the spreader bar does not thread onto the back canes, do not force. Turn the spreader bar around and repeat STEP 7.

8. Line up two (2) bottom mounting holes of back canes with the two (2) mounting holes in the seat frame.

WARNING

The back canes MUST be fastened securely to the seat frame BEFORE using the wheelchair. Torque mounting screws to 156-inch pounds.

9. Reinstall the mounting screw, washer and locknut through the back cane and seat frame mounting holes and torque to 156-inch pounds.
10. Reinstall the mounting screw through the mounting bracket of the back cane, nylon washer, mounting hole in the TOP of the gas cylinder, nylon washer, mounting bracket and washer and securely tighten with the existing locknut. Torque to 75-inch pounds.
11. Reinstall the recliner cable assemblies onto the back canes. Refer to REPLACING RECLINER CABLES in this procedure of the manual.



NOTE: Upholstery not shown for clarity.

FIGURE 5 - CHANGING BACK HEIGHT

NOTE: There are three (3) different cable lengths depending on back height:

BACK HEIGHT (in inches)	18-1/2, 20	22, 24	26
CABLE LENGTH	Short	Medium	Long

NOTE: New recliner cables will be needed if back height is changed to a height not within the length of the original cable.

12. Install the NEW back upholstery onto the back canes.
13. Install the ten (10) or twelve (12) mounting screws (depending on back height) that secure the back upholstery to the recliner back canes.
14. Reinstall headrest extension onto recliner back canes.
15. Adjust the tautness of the back and headrest upholstery. Refer to ADJUSTING BACK OR HEADREST UPHOLSTERY in this procedure of the manual.

CHANGING SEAT DEPTH (FIGURE 6)

NOTE: 16-inch, 17-inch, 18-inch or 19-inch seat depths CAN NOT be increased to 20-inches or deeper. If needing to increase to a seat depth of 20-inches or deeper, the base frame MUST be converted from a STANDARD base frame to a LONG base frame as well.

NOTE: 20-inch, 21-inch or 22-inch seat depths CAN NOT be decreased to 19-inches or less. If needing to decrease to a seat depth of 19-inches or less, the base frame MUST be converted from a LONG base frame to a STANDARD base frame.

To adjust seat depth of wheelchair, use following guidelines:

If the current seat depth is an ODD number, i.e., 17-inches, 19-inches or 21-inches, the seat depth CANNOT be INCREASED without changing the seat frame. Refer to INSTALLING/REPLACING ADJUSTABLE 16 TO 19-INCH DEEP RECLINER SEAT FRAME ONTO ARROW OR X BASE FRAMES in this procedure of the manual.

If the current seat depth is an ODD number, i.e., 17-inches, 19-inches or 21-inches, the seat depth can be DECREASED by 1-inch by installing a 1-inch shorter seat pan. **Refer to the following procedures:**

If the current seat depth is an EVEN number, i.e., ***16-inches, 18-inches, 20-inches or 22-inches, the seat depth CANNOT be DECREASED without changing the seat frame. Refer to INSTALLING/REPLACING ADJUSTABLE 16 TO 19-INCH DEEP RECLINER SEAT FRAME ONTO ARROW OR X BASE FRAME in this procedure of the manual.

**NOTE: 16-inch seat depth is the smallest seat depth available on recliner seat frames.*

If the current seat depth is an EVEN number, i.e., 16-inches, 18-inches, 20-inches or ***22-inches, the seat depth can be INCREASED by 1-inch by installing a 1-inch deeper seat pan. **Refer to the following procedures:**

**NOTE: 22-inch seat depth is the deepest seat depth available on recliner seat frames.*

Seat Pan Removal/Replacement Procedures:

1. Remove the seat cushion from the wheelchair.
2. Remove the six (6) mounting screws and locknuts that secure seat pan, seat positioning strap to the seat frame.
3. Install new 1-inch deeper/shorter seat pan onto seat frame.
4. Reinstall the mounting screws, spacers and locknuts and torque to 75-inch pounds.
5. Remove the protective strips on the seat pan and reinstall the seat cushion onto the seat pan.

NOTE: Clean upholstery with a warm damp cloth and mild detergent to remove superficial soil.

WARNING

Laundering or moisture will reduce the flame retardation of the upholstery.

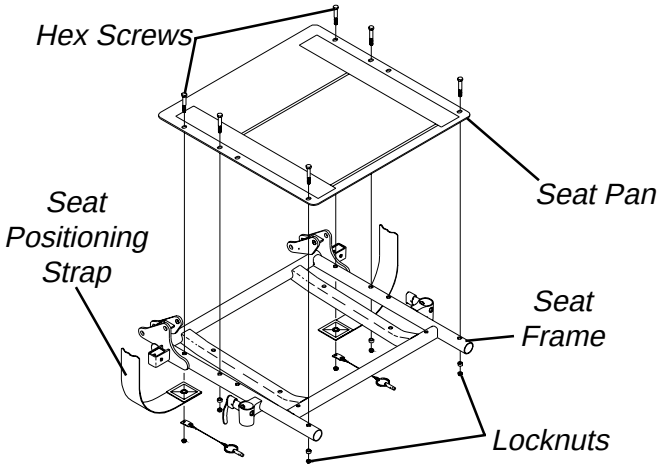


FIGURE 6 - CHANGING SEAT DEPTH

CHANGING SEAT WIDTH

To change seat width, the seat frame must be changed to the desired width. Refer to INSTALLING/REPLACING ADJUSTABLE 16 TO 19-INCH DEEP RECLINER SEAT FRAME ONTO ARROW OR X BASE FRAME in this procedure of the manual.

NOTE: If changing the seat width of the wheelchair, the back and headrest upholstery, seat pan and cushion also need to be changed.

NOTE: If changing the seat width of the wheelchair, the back canes, spreader bar and headrest pillow may also need to be changed. Refer to the following charts:

BACK CANES AND SPREADER BAR SEAT WIDTH RANGES

14-17-INCHES OR 18-24-INCHES

HEADREST PILLOWS SEAT WIDTH RANGES (IN INCHES)

14-15, 16-18, 19-20 OR 21-24

If the seat width required is within the range of the original back canes, spreader bar and headrest pillow, the original components can still be used.

If the seat width required is NOT within the range of the original back canes, spreader bar and headrest pillow, the original components can not be used.

EQUIPMENT OPTION

INSTALLING/REPLACING ADJUSTABLE 16 TO 19-INCH DEEP RECLINER SEAT FRAME ONTO ARROW OR X BASE FRAME (FIGURE 7)

1. Perform instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in PROCEDURE 6 of this manual:
2. Perform one (1) of the following in **PROCEDURE 7** of this manual:
   A. Remove standard seat frame subassembly. Refer to REMOVING/INSTALLING STANDARD SEAT FRAME SUBASSEMBLY.
   B. Remove adjustable seat frame subassembly. Refer to INSTALLING/REMOVING ADJUSTABLE SEAT FRAME ASSEMBLY AND OR COMPONENT REPLACEMENT.
   C. Remove captains van seat. Refer to INSTALLING/REMOVING CAPTAINS VAN SEAT ASSEMBLY.
3. Remove seat pan on recliner.
4. Install new recliner seat assembly onto seat mount plates.
5. Secure recliner seat assembly to seat mount plates with the mounting screws, spacers and locknuts. Torque the mounting screws to 156-inch pounds.

NOTE: There are three (3) types of seat mount plates; low, medium, and high heights. The seat mount plate shown in this illustration represents the medium height. Refer to MOUNTING PLATE - SEAT ANGLE ADJUSTMENT AND INSTALLATION ORIENTATION in PROCEDURE 6 of this manual for illustrations of the low and high heights.

6. Position limit switch onto wheelchair. Refer to POSITIONING LIMIT SWITCH in this procedure of the manual.
7. Reinstall recliner seat pan with existing six (6) mounting screws.
8. Install the two (2) warnings labels onto the two (2) suspension arm assemblies. Refer to FIGURE 7 for correct label placement.
9. Install battery box(es). Refer to INSTALLING/REMOVING BATTERY BOXES- GROUP 24 BATTERY BASE FRAMES or INSTALLING/REMOVING BATTERY BOX - GROUP 22 BATTERY BASE FRAMES in PROCEDURE 9 of this manual.
10. Perform instructions outlined in PREPARATIONS FOR REMOVING/INSTALLING SEAT FRAME (STANDARD FRAME, ADJUSTABLE FRAME, AND CAPTAINS VAN SEAT) in PROCEDURE 6 of this manual:

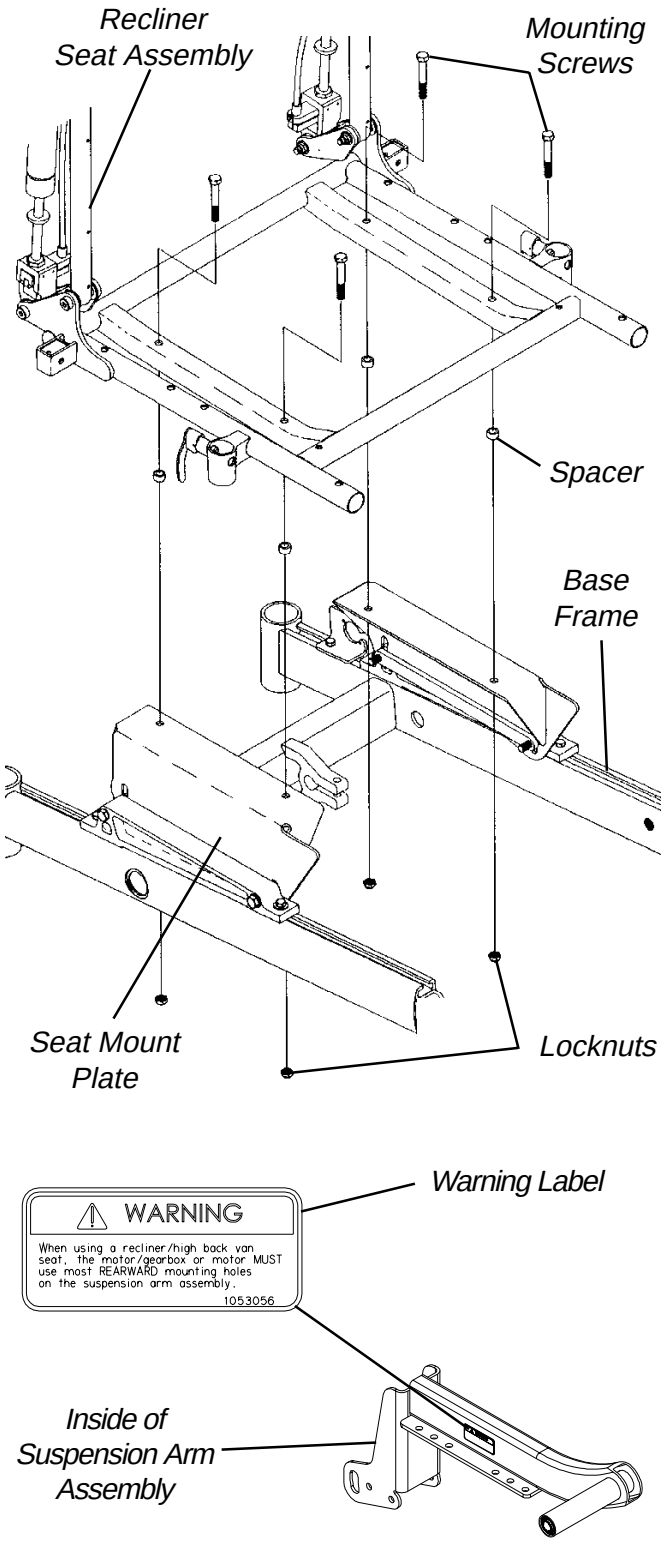


FIGURE 7 - INSTALLING/REPLACING ADJUSTABLE 16 TO 19-INCH DEEP RECLINER SEAT FRAME ONTO ARROW OR X BASE

This Procedure includes the following:
Removing/Installing Group 24 Battery Box Sub-Frame
Removing/Installing Group 22 Battery Box Tray
Converting Group 22 Batteries to Group 24 Batteries
Shock Replacement
Shock Spring Replacement
Rubber Element Replacement
Converting Torque and X Rubber Elements to Shocks
Anti-Tipper Wheel Replacement
Removing/Installing Gearbox
Adjusting Weight Distribution
Repositioning Motor/Gearbox Assembly
Repositioning Gearless/Brushless Motor
Replacing Suspension Arm for Wheelchairs with Motor/Gearbox assembly
Replacing Suspension Arm for Wheelchairs with Gearless/Brushless Motor
Removing/Installing the Anti-tip Assembly

WARNING

After ANY adjustments, repair or service and BEFORE use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

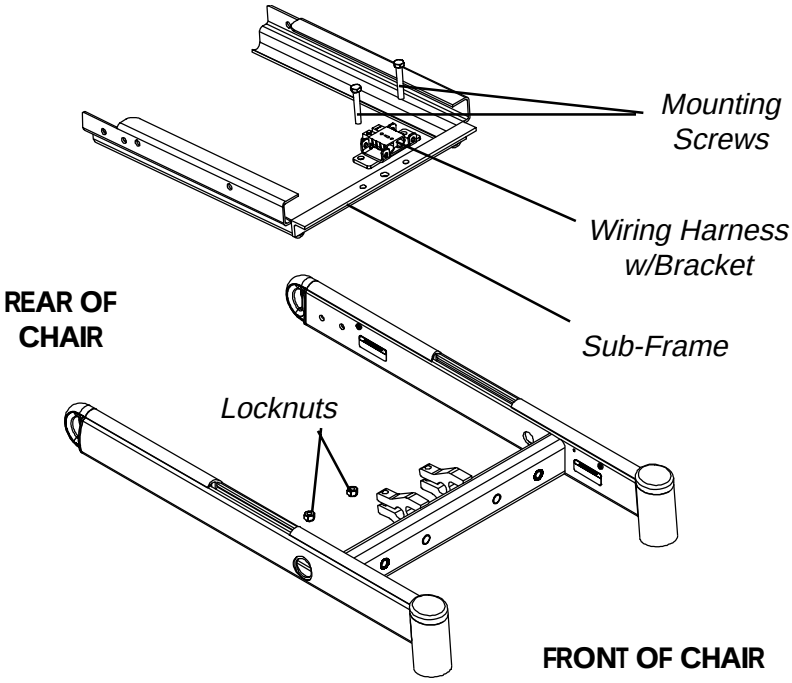
REMOVING/INSTALLING GROUP 24 BATTERY BOX SUB-FRAME (FIGURE 1)

Removing

1. Remove the battery boxes. Refer to INSTALLING/REMOVING GROUP 24 BATTERY BOXES in PROCEDURE 9 of this manual.
2. Remove the two (2) mounting screws and locknuts that secure the wiring harness w/bracket and the sub-frame to the base frame.
3. Perform one (1) of the following:
   A. WHEELCHAIRS EQUIPPED WITH VENT TRAY - Remove the four (4) mounting screws that secure the shocks, retainer bar, spacers and retainer clips to the base frame.
   B. WHEELCHAIRS WITHOUT VENT TRAY - Remove the four (4) mounting screws that secure the shocks and spacers to the base frame.
4. Remove the existing sub-frame assembly.

Installing

1. Install the two (2) mounting screws and locknuts that secure the wiring harness w/bracket and the NEW sub-frame to the base frame. Use Loctite 242 and torque mounting screws to 160-inch pounds.
2. Perform one (1) of the following:
   A. WHEELCHAIRS EQUIPPED WITH VENT TRAY - Reinstall the four (4) mounting screws that secure the shocks, retainer bar, spacers and retainer clips to the base frame. Use Loctite 242 and torque mounting screws to 160-inch pounds.
   B. WHEELCHAIRS WITHOUT VENT TRAY - Reinstall the four (4) mounting screws that secure the shocks and spacers to the base frame.
3. Reinstall the battery boxes. Refer to INSTALLING/REMOVING GROUP 24 BATTERY BOXES in PROCEDURE 9 of this manual. Use Loctite 242 and torque mounting screws to 160-inch pounds.



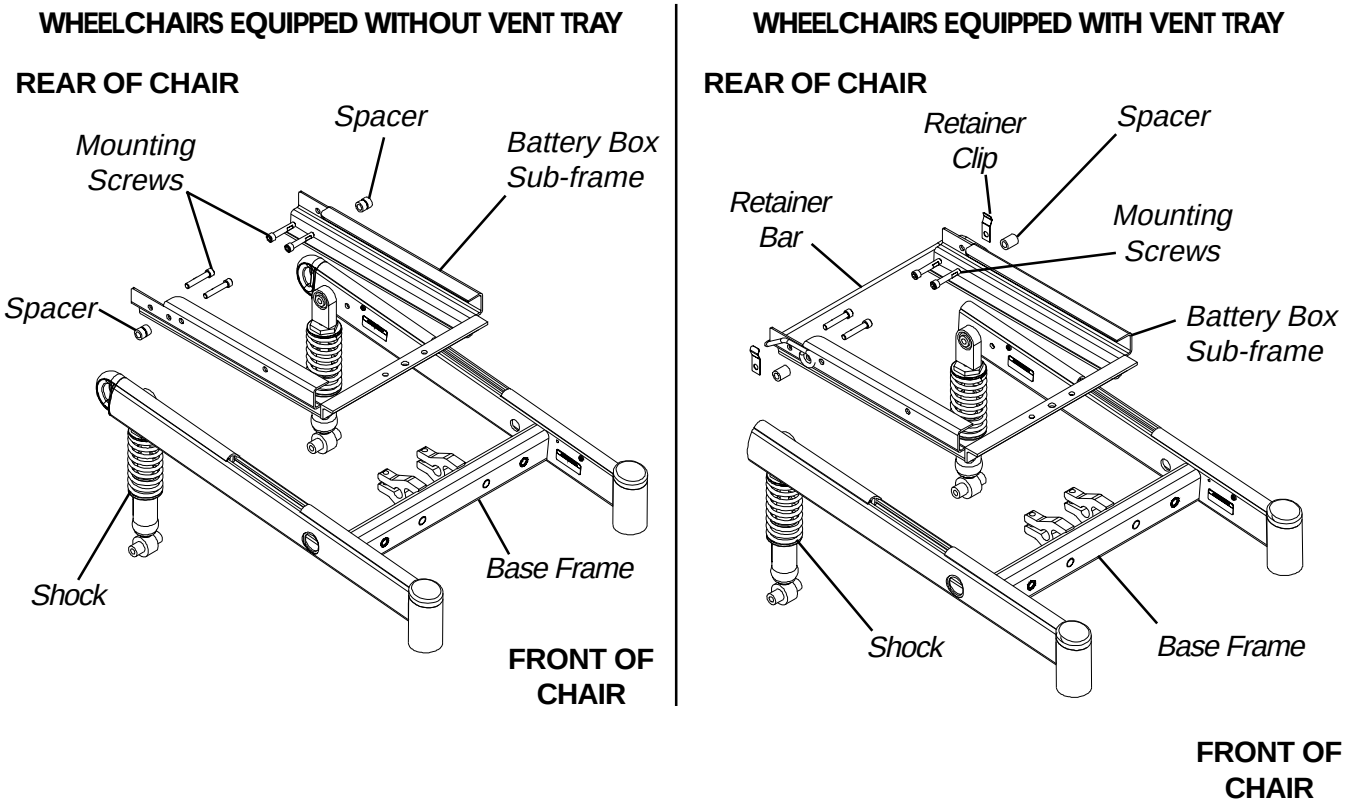


FIGURE 1 - REMOVING/INSTALLING GROUP 24 BATTERY BOX SUB-FRAME

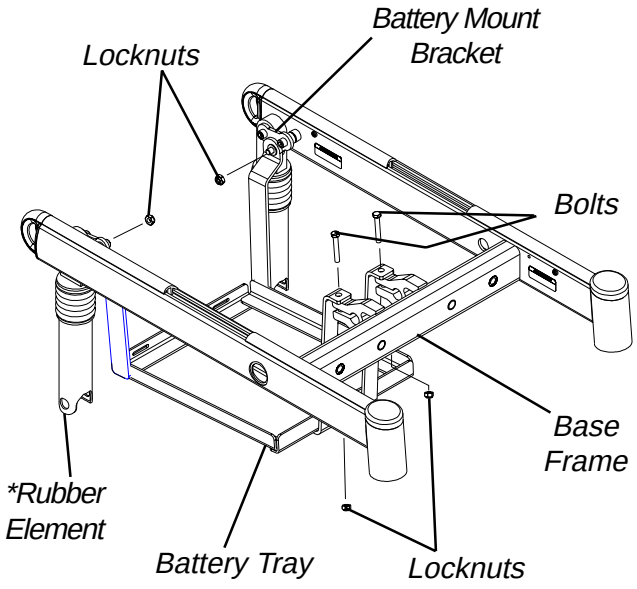
REMOVING/INSTALLING 22NF BATTERY BOX TRAY (FIGURE 2)

Removing

1. Remove the battery box. Refer to INSTALLING/REMOVING 22NF BATTERY BOX in PROCEDURE 9 of this manual.
2. Remove the two (2) rear locknuts that secure the battery box tray to battery mount brackets.
3. Remove the two (2) front bolts and locknuts that secure the battery box tray to the base frame.
4. Remove the battery tray from the base frame.

Installing

1. Install battery tray onto base frame.
2. Secure the rear of the battery tray to battery mount brackets with existing locknuts. Torque to 160-inch pounds.
3. Secure the front of the battery tray to the base frame with existing mounting screws and locknuts. Torque to 160-inch pounds.
4. Reinstall the battery box. Refer to INSTALLING/REMOVING BATTERY BOX - 22NF BATTERY BASE FRAMES in PROCEDURE 9 of this manual.



**NOTE: Illustration depicts the rubber element. Battery Box Tray removes in the same manner for shock assembly.*

FIGURE 2 - REMOVING/INSTALLING 22NF BATTERY BOX TRAY

EQUIPMENT OPTION

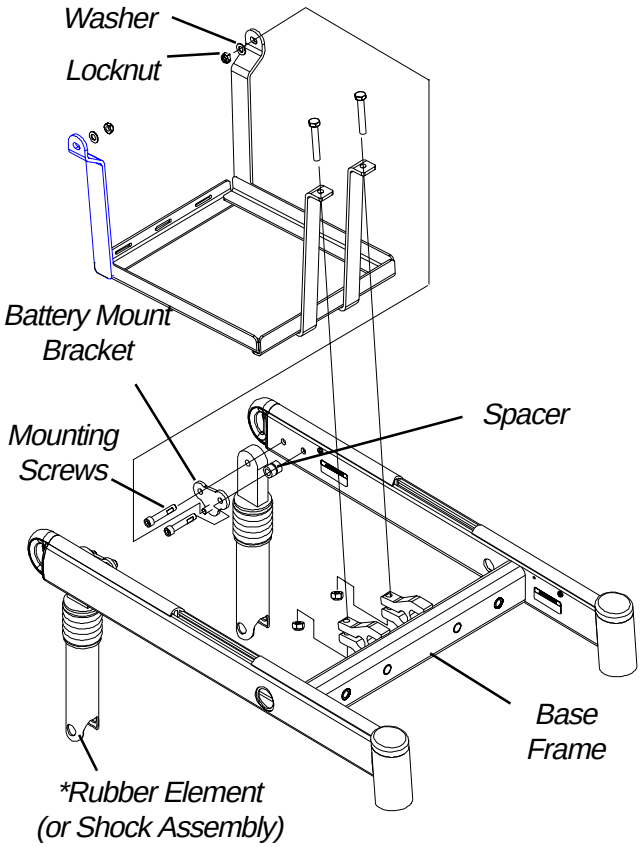
CONVERTING 22NF BATTERY BOX TRAY TO GROUP 24 BATTERY BOX SUB FRAME ASSEMBLY

Removing 22NF Components (FIGURE 3)

1. Remove the battery box. Refer to INSTALLING/REMOVING 22NF BATTERY BOX/BATTERIES in PROCEDURE 9 of this manual.
2. Remove the battery box tray. Refer to REMOVING/INSTALLING THE 22NF BATTERY BOX TRAY in this procedure of the manual.
3. Remove the wiring harness. Refer to REMOVING/INSTALLING THE WIRING HARNESS in PROCEDURE 10 of this manual.

NOTE: The battery box tray and the battery mount brackets will not be reused. Mounting screws and spacers will be reused.

4. Remove the four (4) mounting screws that secure the battery mount brackets to the base frame.
5. Remove the battery mount brackets.



**NOTE: Illustration depicts rubber element. Battery Mount Brackets remove in the same manner for the shock assembly.*

FIGURE 3 - REMOVING 22NF COMPONENTS

Installing Group 24 Components (FIGURE 4)

1. Line up the mounting holes in the front of the NEW battery box sub-frame and the NEW wiring harness w/bracket with the mounting holes in the base frame.
2. Install the two (2) mounting screws through the wiring harness w/bracket, battery box sub-frame, and base frame.
3. Install the locknuts onto mounting screws. Torque to 160-inch pounds.
4. Perform one (1) of the following:

   A. WHEELCHAIRS EQUIPPED WITH VENT TRAY

   WARNING

   The Battery Box Retainer/Retainer Clip MUST be fastened securely in place before using the wheelchair. Use Loctite 242 and torque to 160-inch pounds.

   - Position the retainer clip between the NEW battery box sub-frame and the top of the rubber element or shock assembly making sure the retainer clip mounting hole is towards the bottom and the closed end of the clip is against the battery box retainer bar.

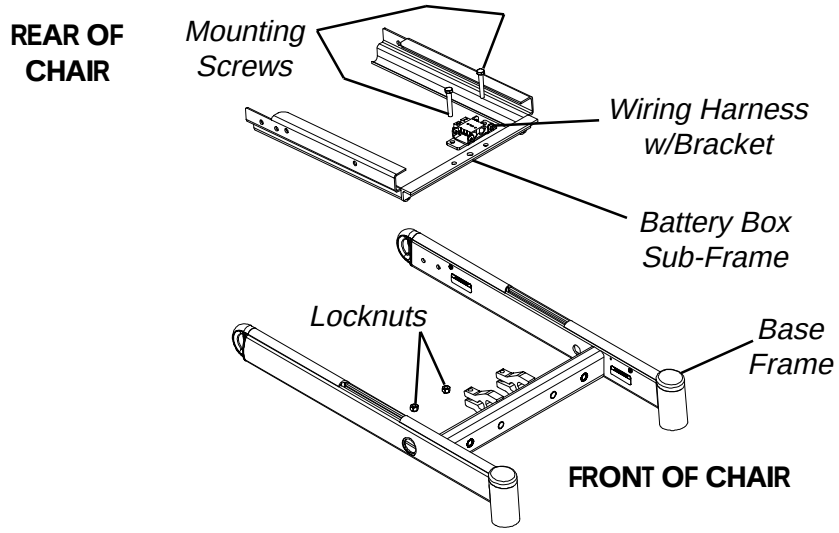
     NOTE: Make sure the closed end of the battery box retainer clip is pointing up.

   - Install the mounting screw that secures the retainer clip to the battery box sub-frame. Use Loctite® 242 and torque to 160-inch pounds.
   - Line up the NEW battery box retainer bar and spacers with mounting holes in the base frame (FIGURE 5).
   - Reinstall the mounting screws that secure the battery box retainer bar to the base frame. Use Loctite 242 and torque to 160-inch pounds (FIGURE 5).

   B. WHEELCHAIRS EQUIPPED WITHOUT VENT TRAY - Reinstall the four (4) mounting screws that secure the shocks and spacers to the base frame.

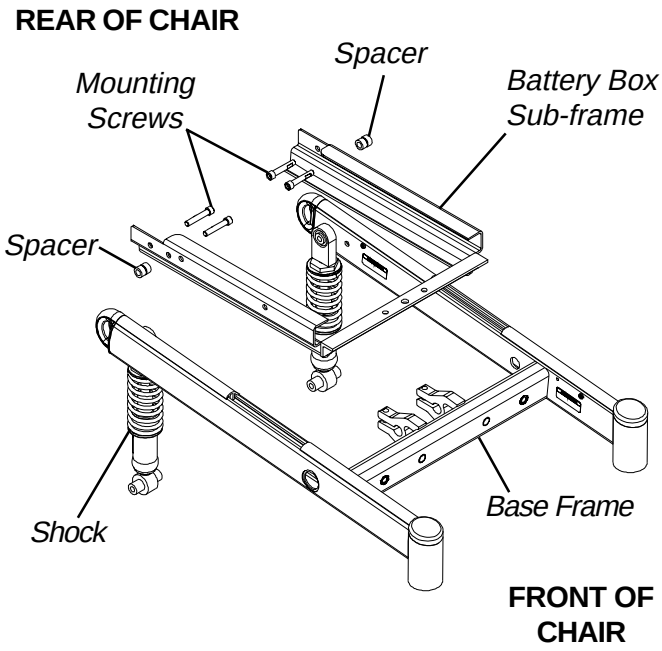
5. Perform STEPS 2-7 of REMOVING/INSTALLING THE WIRING HARNESS in PROCEDURE 10 of this manual to complete the wiring harness installation.
6. Install the group 24 battery boxes. Refer to INSTALLING/REMOVING GROUP 24 BATTERY BOXES in PROCEDURE 9 of this manual.

STEPS 1 - 3



STEPS 4 - 7

WHEELCHAIRS EQUIPPED WITHOUT VENT TRAY



WHEELCHAIRS EQUIPPED WITH VENT TRAY

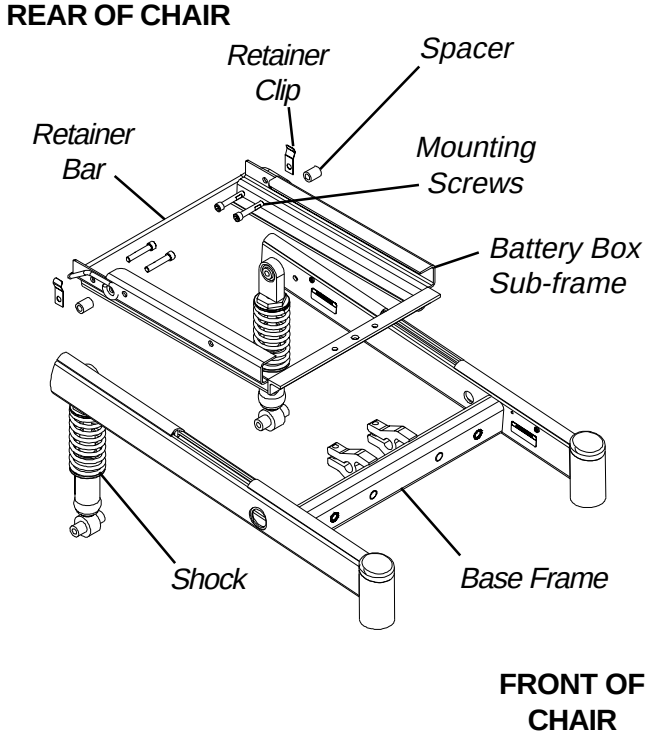


FIGURE 4 -INSTALLING GROUP 24 COMPONENTS

SHOCK OR RUBBER ELEMENT REPLACEMENT FOR WHEELCHAIRS EQUIPPED WITH GROUP 24 BATTERIES (FIGURES 5 AND 6)

1. Remove the group 24 battery boxes. Refer to REMOVING/INSTALLING GROUP 24 BATTERY BOXES FOR WHEELCHAIRS WITHOUT VENT TRAY or REMOVING/INSTALLING GROUP 24 BATTERY BOXES FOR WHEELCHAIRS EQUIPPED WITH VENT TRAY in PROCEDURE 9 of this manual.
2. Remove the drive wheel from the wheel hub. Refer to REMOVING/INSTALLING THE DRIVE WHEELS in PROCEDURE 12 of this manual.
3. Perform one (1) of the following:
   A. **Wheelchairs equipped with vent tray** - Loosen the hex screw that secures the battery box retainer bar to the base frame.
   B. **Wheelchairs without vent tray** - Loosen the rearmost hex screw that secures the battery box sub-frame and spacer to the base frame.
4. Perform one (1) of the following:
   A. **Wheelchairs equipped with vent tray** - Remove the mounting screw that secures the top of the shock and retainer clip to the base frame.
   B. **Wheelchairs without vent tray** - Remove the mounting screw that secures the top of the shock to the base frame.
5. Perform one (1) of the following:
   A. FOR SHOCKS - Remove the mounting screw, two (2) short spacers, two (2) large washers and locknut that secure the shock to the anti-tip bracket and suspension arm.
   B. FOR RUBBER ELEMENTS - Remove the mounting screw, two (2) short spacers, two (2) large washers, two (2) small washers, one (1) 2-inch spacer and locknut that secure the rubber element to the anti-tip bracket and suspension arm.
6. Remove the shock or rubber element.
7. Perform one (1) of the following sections:
   A. **Wheelchairs equipped with vent tray** -

WARNING

The Battery Box Retainer/Retainer Clip MUST be fastened securely in place before using the wheelchair. Use Loctite 242 and torque to 160-inch pounds.

   - Position retainer clip between shock and battery box sub-frame making sure the retainer clip mounting hole is towards the bottom and the closed end of clip is against battery box retainer bar.
   - Secure the top of shock and retainer clip to base frame. Apply Loctite 242 and torque to 160-inch pounds.
   - Apply Loctite 242 and torque the hex screw that secures the battery box retainer bar to the base frame to 160-inch pounds. pounds.

   B. Wheelchairs without vent tray - Secure the top of shock to base frame. Apply Loctite 242 and torque to 160-inch pounds.
8. Perform one (1) of the following sections:
   A. FOR SHOCKS - Secure the NEW shock to the anti-tip bracket and suspension arm with the existing mounting screw, two (2) large washers, two (2) short spacers, and locknut. Torque to 13 ft/lbs.
   B. FOR RUBBER ELEMENTS - Secure the NEW rubber element to the anti-tip bracket and suspension arm with the existing mounting screw, two (2) large washers, two (2) small washers, two (2) short spacers, one (1) 2-inch spacer and locknut. Torque to 13 ft/lbs.

9. Reinstall the drive wheel from the wheel hub. Refer to REMOVING/INSTALLING THE DRIVE WHEELS in PROCEDURE 12 of this manual.
10. Reinstall the group 24 battery boxes. Refer to INSTALLING/REMOVING GROUP 24 BATTERY BOXES in PROCEDURE 9 of this manual.

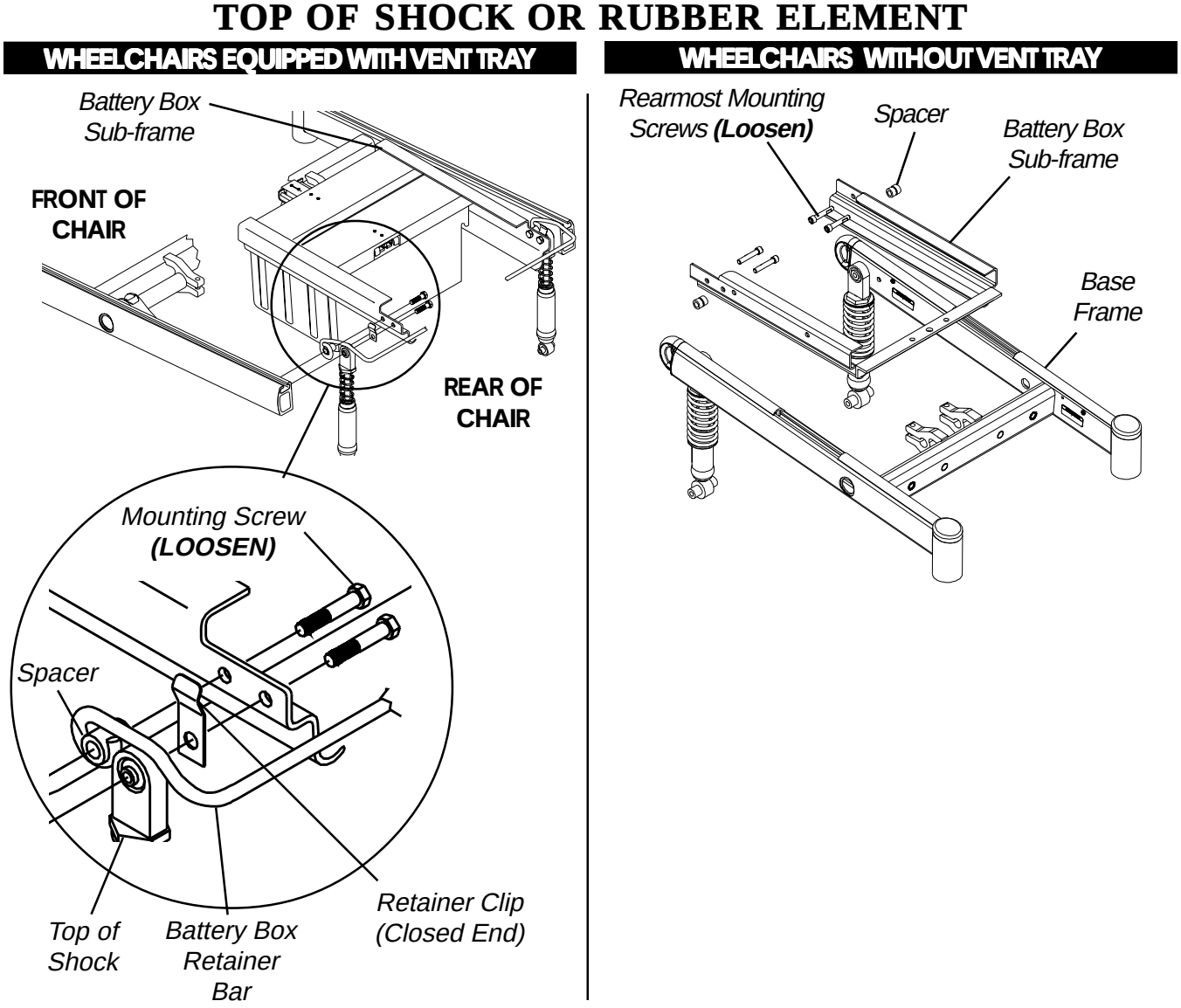


FIGURE 5 - SHOCK OR RUBBER ELEMENT REPLACEMENT FOR WHEELCHAIRS EQUIPPED WITH GROUP 24 BATTERIES

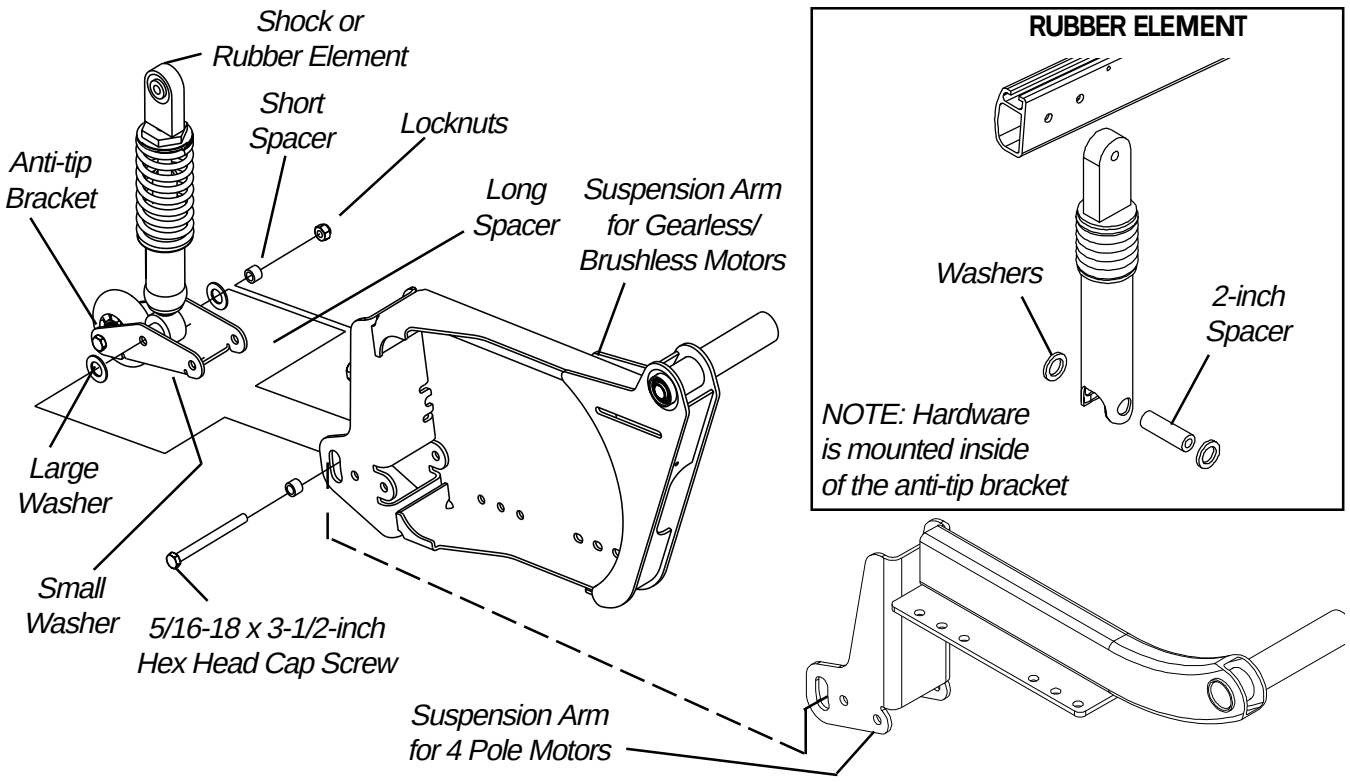


FIGURE 6 - SHOCK REPLACEMENT FOR WHEELCHAIRS EQUIPPED WITH GROUP 24 BATTERIES OR 22NF BATTERIES

SHOCK OR RUBBER ELEMENT REPLACEMENT FOR WHEELCHAIRS EQUIPPED WITH 22NF BATTERIES (FIGURES 6 AND 7)

1. Remove the 22NF battery box INSTALLING/REMOVING 22NF BATTERY BOXES in PROCEDURE 9 of this manual.
2. Remove the drive wheel from the wheel hub. Refer to REMOVING/INSTALLING THE DRIVE WHEELS in PROCEDURE 12 of this manual.
3. Remove the mounting screw that secures the top of the shock to the base frame. (FIGURE 7)
4. **For 3-inch anti-tip assemblies** (FIGURE 6) - Remove the mounting screw, two (2) short spacers, two (2) large washers and lcoknut that secure the shock to the anti-tip bracket and suspension arm.
5. Remove the shock from the base frame.
6. Secure the top of the NEW shock to base frame. Apply Loctite 242 and torque to 160-inch pounds.(FIGURE 7)
7. Secure the bottom of the NEW shock to the suspension arm with the existing mounting screw and locknut. Apply Loctite 242 and torque to 160-inch pounds. (FIGURE 6)
8. Install the drive wheel from the wheel hub. Refer to REMOVING/INSTALLING THE DRIVE WHEELS in PROCEDURE 12 of this manual.
9. Install the 22NF battery box. Refer to INSTALLING/REMOVING 22NF BATTERY BOX in PROCEDURE 9 of this manual.

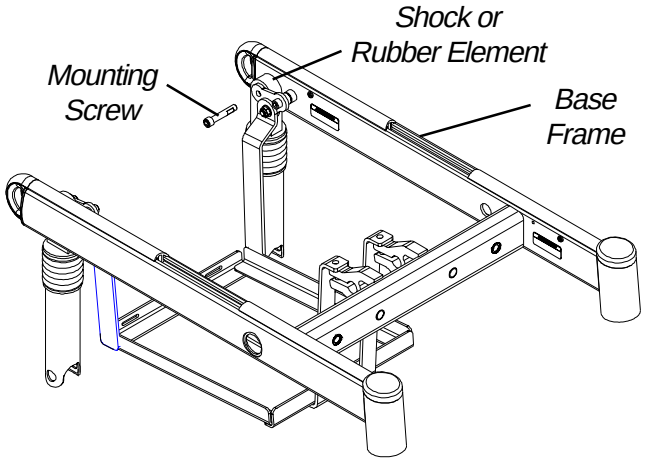
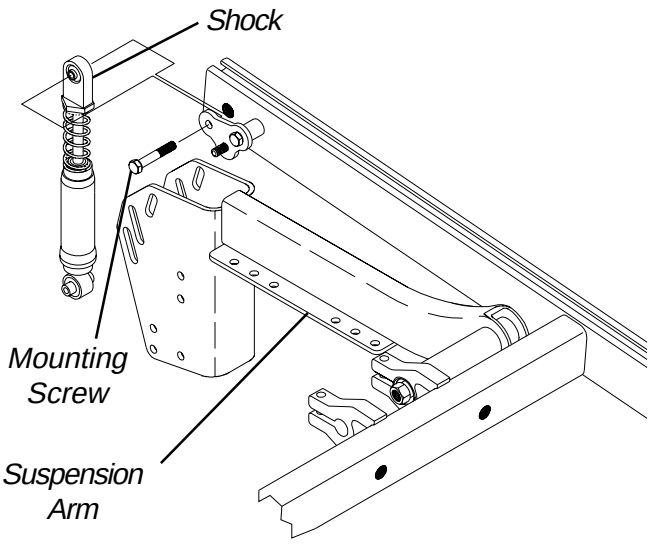


FIGURE 7 - SHOCK OR RUBBER ELEMENT REPLACEMENT FOR WHEELCHAIRS EQUIPPED WITH 22NF BATTERIES

SHOCK SPRING REPLACEMENT (FIGURE 6)

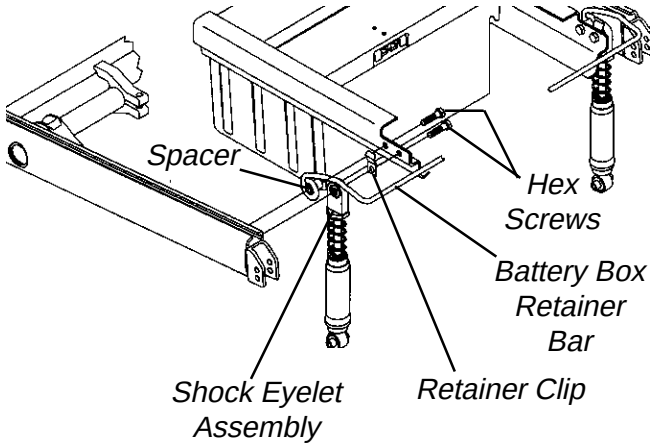
1. Remove the 22NF battery box or group 24 battery boxes. Refer to INSTALLING/REMOVING 22NF BATTERY BOX or INSTALLING/REMOVING GROUP 24 BATTERY BOXES in PROCEDURE 9 of this manual.
2. **GROUP 24 BATTERIES ONLY -** Loosen the mounting screw that secures the battery box retainer bar to the base frame.
3. Remove the mounting screw that secures the top of the shock to the suspension arm.
4. Swing the top of the shock rearward.
5. Hold the spring retainer and turn the shock eyelet assembly counterclockwise to unthread it from the shock.
6. Remove the spring retainer and spring.
7. Place the NEW spring onto the shock.
8. Reinstall the shock eyelet assembly and the spring retainer onto the NEW spring.
9. While holding the spring retainer, torque the shock eyelet assembly to 245-inch pounds.
10. Position the retainer clip between the shock and the battery box sub-frame making sure the retainer clip mounting hole is towards the bottom and the closed end of the clip is against the battery box retainer.
11. Secure top of shock and retainer clip to base frame. Apply Loctite 242 and torque to 160-inch pounds.
12. **GROUP 24 BATTERIES ONLY** - Apply Loctite 242 and torque the hex screw that secures the battery box retainer bar to the base frame to 160-inch pounds.
13. Reinstall the 22NF battery box or group 24 battery boxes. Refer to INSTALLING/REMOVING 22NF BATTERY BOX or INSTALLING/REMOVING GROUP 24 BATTERY BOXES in PROCEDURE 9 of this manual.

GROUP 22 BATTERIES



NOTE: Shock exploded away for clarity. There is no need to remove shock from suspension arm.

GROUP 24 BATTERIES



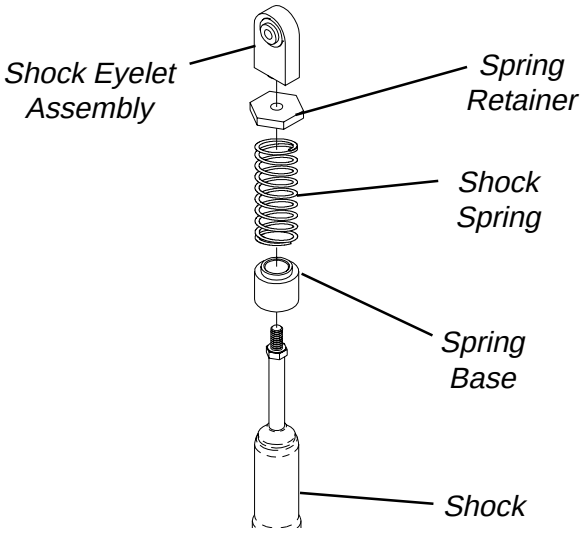


FIGURE 6 - SHOCK SPRING REPLACEMENT

REMOVING/INSTALLING GEARBOX (FIGURE 8)

Removing

1. Remove the drive wheels from the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 12 of this manual.
2. Remove the drive wheel hub from the existing gearbox drive shaft. Refer to REMOVING/INSTALLING DRIVE WHEEL HUBS in PROCEDURE 12 of this manual.

NOTE: Note mounting position of gearbox to suspension arm before disassembly.

NOTE: To reposition the gearbox on the suspension arm, refer to WEIGHT DISTRIBUTION in this procedure of the manual.

3. Remove the four (4) hex screws and two (2) washers that secure the existing motor/gearbox to the suspension arm.
4. Remove existing motor from gearbox. Refer to MOTOR REPLACEMENT in PROCEDURE 12 of this manual.
5. Install existing motor onto NEW gearbox. Refer to MOTOR REPLACEMENT in PROCEDURE 12 of this manual.

Installing

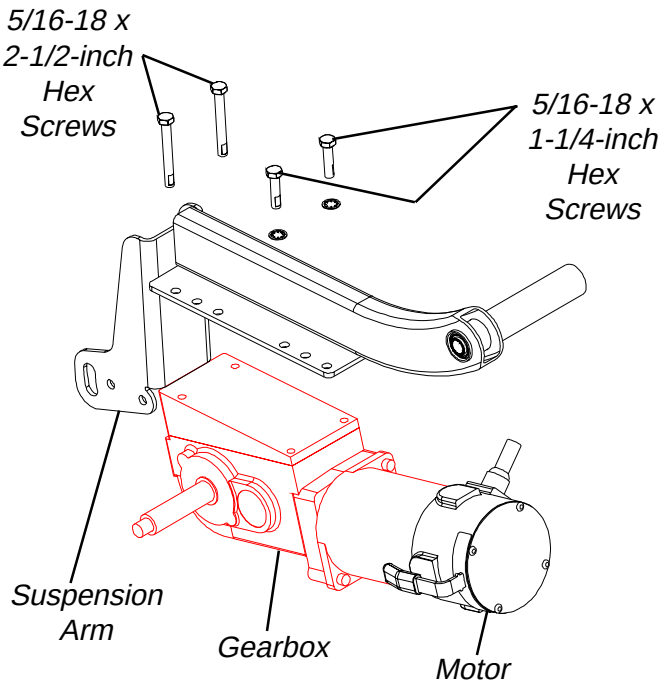
CAUTION

The REAR hex screws that secure the gearbox to the suspension arm MUST be 5/16-18 x 2-1/2-inches long and the FRONT hex screws that secure the gearbox to the suspension arm MUST be 5/16-18 x 1-1/4-inches long. Otherwise damage to the gearbox casting can result.

1. Position NEW gearbox with noted mounting holes.
2. When reassembling gearbox to suspension arm, use Loctite 242 and torque hex screws to 160-inch pounds.

NOTE: Replace any parts that show signs of wear or damage.

3. Reinstall the drive wheel hub to the new gearbox driveshaft. Refer to REMOVING/INSTALLING DRIVE WHEEL HUBS in PROCEDURE 12 of this manual.
4. Reinstall the drive wheels onto the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 12 of this manual.



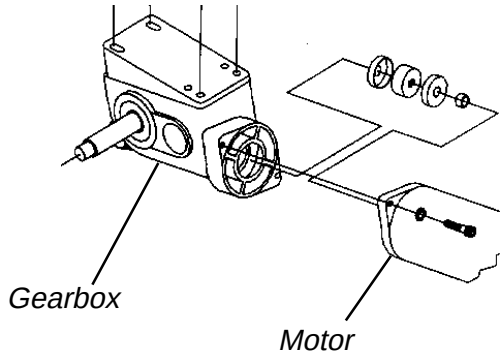


FIGURE 8 - REMOVING/INSTALLING GEARBOX

ADJUSTING WEIGHT DISTRIBUTION (FIGURE 9)

NOTE: Seat mount plates and seat support brackets allow the seat frame to be repositioned along the base frame. The range is determined by position of the seat stop screws. The front seat stop screw is positioned at 4-inches and the rear seat stop screw is positioned at 10-inches. Both seat stop screw positions are measured from the front of the base frame.

NOTE: The position of the seat support brackets is factory set at 7-inches, this measured from the front of the base frame to the front of the seat support bracket. This will put about 70% of the total weight of the chair and user over the large wheels. However, this setting may not be the most desirable in terms of maneuverability, front rigging clearance and comfort for the user.

Adjustment Options

NOTE: This section will provide the user with some knowledge of what to expect if the following adjustments are made.

1. Moving the seat forward.

   Advantage: This adjustment allows more clearance for front riggings and a more stable "feel" for the user.

   Disadvantage: More weight is put on front casters and makes turning more difficult.

NOTE: This option can also be accomplished by moving the motor backward on the suspension arm. Refer to RE-POSITIONING GEARBOX in this procedure of the manual.

2. Moving the seat rearward.

   Advantage: Makes turning easier and provide better traction for the large wheels.

   Disadvantage: This adjustment, however, allows less clearance for front riggings and the user will experience more engagement of the anti-tippers.

NOTE: This option can also be accomplished by moving the motor forward on the suspension arm. Refer to REPOSITIONING GEARBOX in this procedure of the manual.

Adjusting Weight Distribution Procedure

1. Loosen the four (4) mounting screws that secure the seat support brackets to the base frame.

WARNING

DO NOT adjust seat beyond limit stops.

2. Adjust seat forward or back to the position determined from the previous section ADJUSTMENT OPTIONS.
3. Retighten the four (4) mounting screws securing the seat support brackets to the base frame.
4. Test wheelchair maneuverability, comfort, and handling.
5. Repeat STEPS 1-4 for further adjustment, if necessary.

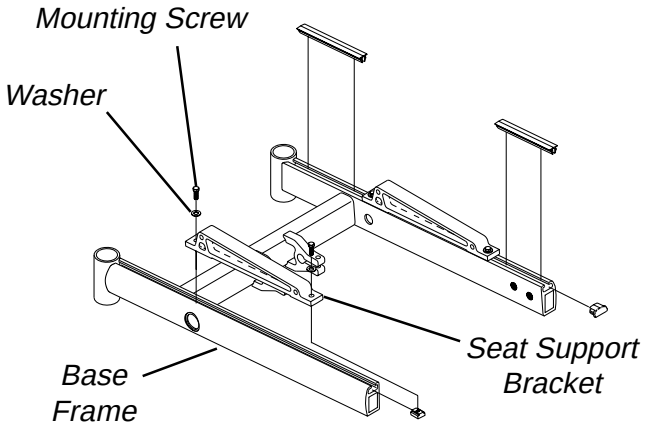


FIGURE 9 - ADJUSTING WEIGHT DISTRIBUTION

REPOSITIONING THE MOTOR / GEARBOX (FIGURE 10)

NOTE: The motor/gearbox assembly can be repositioned to lengthen or shorten the wheelbase by 2-inches in 1-inch increments.

STANDARD POSITION - LENGTHENS the wheelbase and gives you the most stability and standard maneuverability.

1 - INCH FORWARD - CENTERS the wheelbase and gives you standard stability and maneuverability.

2 - INCH FORWARD - SHORTENS the wheelbase and increases maneuverability and distributes additional weight on rear wheels.

WARNING

When using a recliner/high back van seat, the motor/gearbox or motor MUST use most REARWARD mounting holes on the suspension arm assembly.

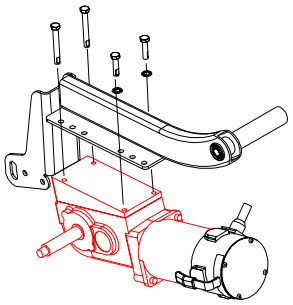
1. Determine the desired position for the gearbox on the wheelchair.
2. Remove the drive wheels from the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 12 of this manual.
3. Remove gearbox from the suspension arm. Refer to REMOVING/INSTALLING GEARBOX in this procedure of the manual.
4. Move gearbox to the position determine in STEP 1.

NOTE: If the wheelchair is equipped with 9-inch casters on a standard or heavy duty base, the 2-inch forward position CAN NOT be utilized.

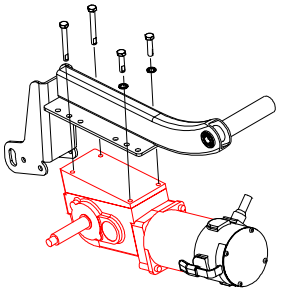
5. Reinstall the gearbox onto the existing suspension arm. Refer to REMOVING/INSTALLING GEARBOX in this procedure of the manual.
6. Repeat STEPS 3-5 for opposite side of the wheelchair.
7. Reinstall the drive wheel onto the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 12 of this manual.

MOTOR/GEARBOX ASSEMBLY

Standard - Approximately 65% of weight over rear wheels



1 - Inch Forward - Approximately 70% of weight over rear wheels



2 - Inch Forward - Approximately 75% of weight over rear wheels

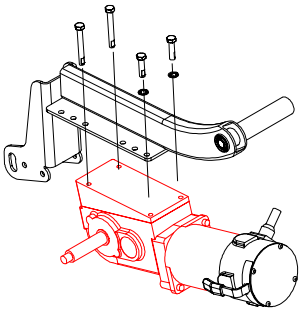


FIGURE 10 - REPOSITIONING MOTOR/GEARBOX

REPOSITIONING THE GEARLESS/BRUSHLESS MOTOR (FIGURE 11,12)

Acceptable mounting positions for the gearless/brushless motor.

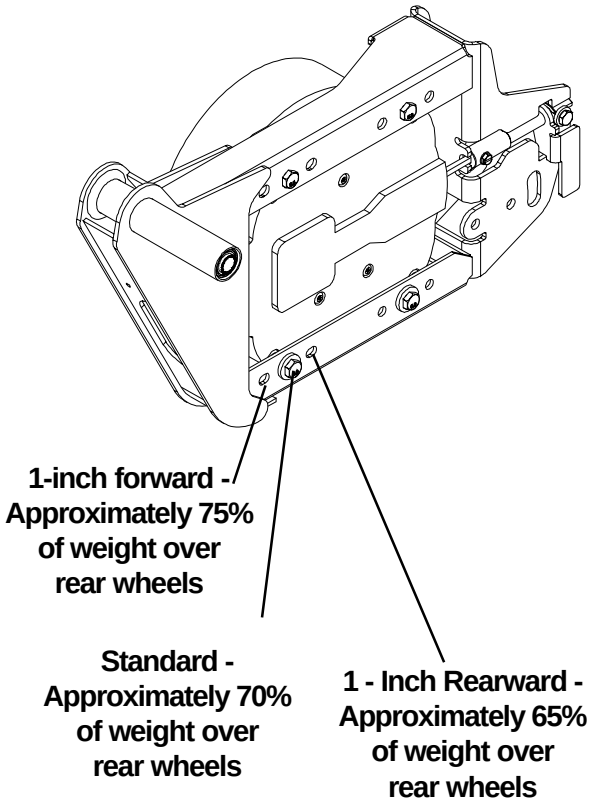
NOTE: On models equipped with ifixed back only, the gearless/brushless motor can be repositioned to lengthen or shorten the wheelbase by 2-inches in 1-inch increments.

ARROW AND RANGER X WITH FIXED BACK

STANDARD POSITION - CENTERS the wheelbase and gives you standard stability and maneuverability.

1-INCH REARWARD- LENGTHENS the wheelbase and gives you the most stability and standard maneuverability.

1-INCH FORWARD - SHORTENS the wheelbase and increases maneuverability and distributes additional weight on rear wheels.


1-inch forward - Approximately 75% of weight over rear wheels
Standard - Approximately 70% of weight over rear wheels
1 - Inch Rearward - Approximately 65% of weight over rear wheels

ARROW, RANGER X,AND TORQUE SP WITH WITH MANUAL RECLINER, 2G POWERED SEATIING SYSTEM, OR HIGH BACK VAN SEAT

STANDARD POSITION - LENGTHENS the wheelbase and gives you the most stability and standard maneuverability.

1-INCH FORWARD - CENTERS the wheelbase and gives you standard stability and maneuverability.

2-INCH FORWARD - SHORTENS the wheelbase and increases maneuverability and distributes additional weight on rear wheels.

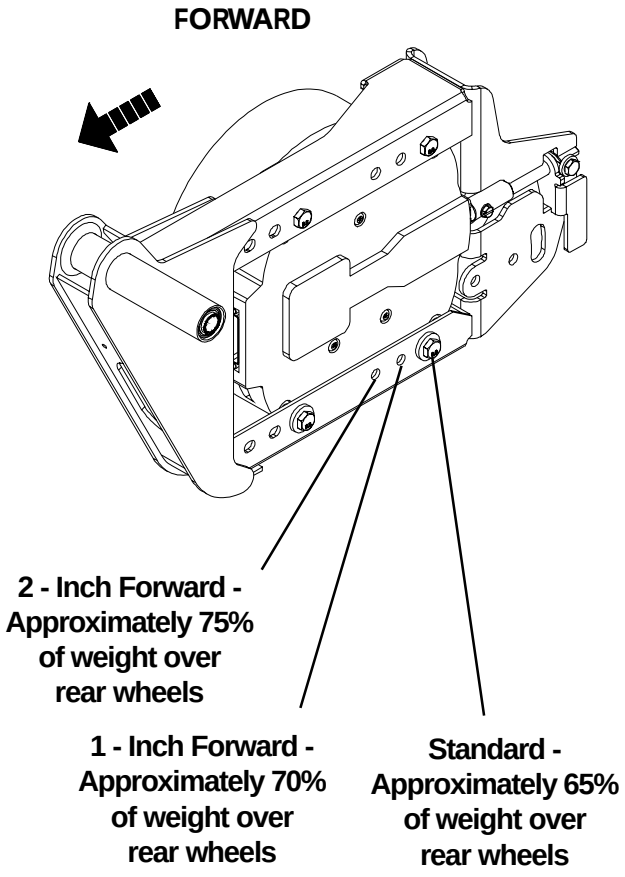

FORWARD
2 - Inch Forward - Approximately 75% of weight over rear wheels
1 - Inch Forward - Approximately 70% of weight over rear wheels
Standard - Approximately 65% of weight over rear wheels

FIGURE 11 - REPOSITIONING THE GEARLESS/BRUSHLESS MOTOR

1. Determine the desired mounting position of the gearless/brushless motor. Refer to ACCEPTABLE MOUNTING POSITIONS FOR THE GEARLESS/BRUSHLESS MOTOR in this procedure of the manual.
2. Remove the 22NF battery box or group 24 battery boxes. Refer to INSTALLING/REMOVING BATTERY BOX - 22NF BATTERY BASE FRAMES or INSTALLING/REMOVING BATTERY BOXES - GROUP 24 BATTERY BASE FRAMES in PROCEDURE 9 of this manual.
3. If necessary, remove the battery box tray. Refer to REMOVING THE BATTERY BOX TRAY in this procedure of the manual.
4. Remove the drive wheel from the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 12 of this manual.
5. Loosen the adjustment screw that secures the motor release handle to the brake release shaft.
6. Remove the four (4) mounting screws and washers that secure the motor to the suspension arm.
7. Slide the motor forward or backward to the desired mounting position.
8. Secure the motor to the mounting position determined in STEP 1 and secure with the four (4) existing mounting screws and washers. Torque to 13 foot/pounds.
9. Securely tighten adjustment screw.

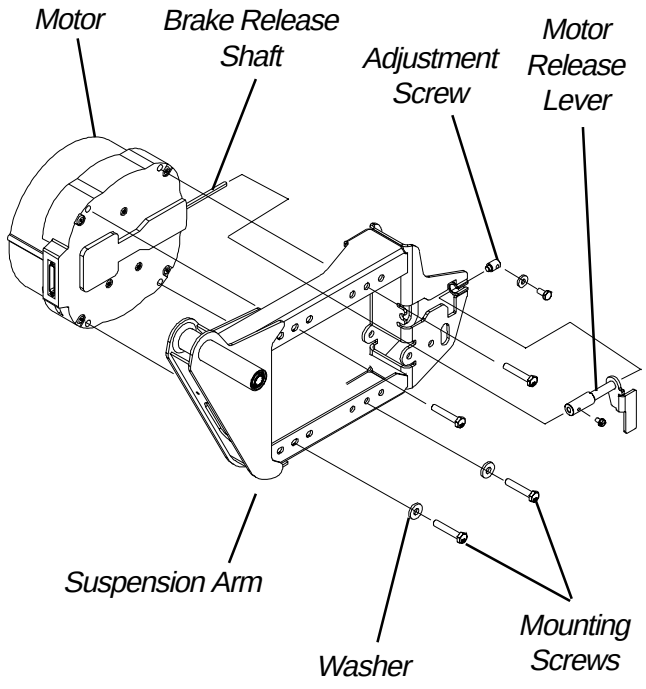


FIGURE 12 - REPOSITIONING THE GEARLESS/ BRUSHLESS MOTOR

10. Reinstall the drive wheel to the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 12 of this manual.
11. Repeat STEPS 1-9 for opposite side of wheelchair.
12. If necessary, reinstall the battery box tray. Refer to REMOVING THE BATTERY BOX TRAY in this procedure of the manual.
13. Remove the 22NF battery box or group 24 battery boxes. Refer to INSTALLING/REMOVING BATTERY BOX - 22NF BATTERY BASE FRAMES or INSTALLING/REMOVING BATTERY BOXES - GROUP 24 BATTERY BASE FRAMES in PROCEDURE 9 of this manual.

REPLACING SUSPENSION ARM FOR WHEELCHAIRS WITH MOTOR/ GEARBOX ASSEMBLY (FIGURE 13)

1. Remove the drive wheels from the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 12 of this manual.
2. Loosen the hex screws that secure wiring harness to sub-frame assembly.
3. Remove gearbox from the existing suspension arm. Refer to REMOVING/INSTALLING GEARBOX in this procedure of the manual.
4. Remove plug buttons from the middle of the base frame.
5. Remove the hex screws and the beveled washers that secure the suspension arm assembly to the base frame.
6. Remove existing suspension arm from the wheelchair.

NOTE: When installing the NEW suspension arm, the beveled washers MUST be placed on the inside and outside of the base frame, with the bevels facing each other.

7. Install the NEW suspension arm assembly onto the base frame.

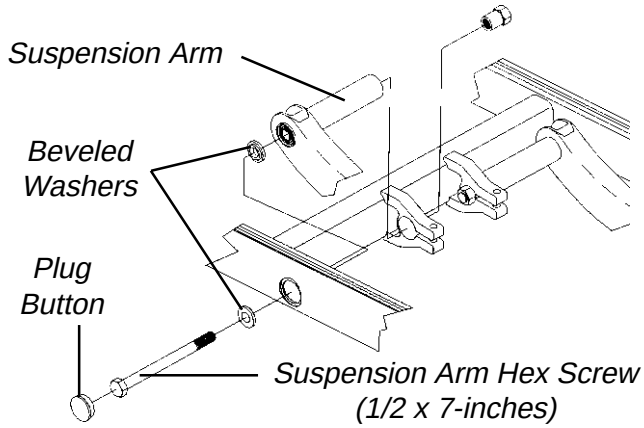


FIGURE 13 - REPLACING SUSPENSION ARM FOR WHEELCHAIRS WITH MOTOR/GEARBOX ASSEMBLY

8. Torque suspension arm hex screws (1/2 x 7-inches) to 85 FOOT pounds (approximately 1,020-inch pounds) and replace plug buttons.
9. Reinstall the gearbox onto the existing suspension arm. Refer to REMOVING/INSTALLING GEARBOX in this procedure of the manual.
10. Tighten the hex screws that secure wiring harness to sub-frame assembly securely.
11. Reinstall the drive wheel onto the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 12 of this manual.
12. Repeat STEPS 1-12 for the opposite side of the wheelchair, if necessary.

REPLACING SUSPENSION ARM FOR WHEELCHAIRS WITH GEARLESS/ BRUSHLESS MOTORS (FIGURE 14)

1. Perform one (1) of the following:
   A. Remove the seating system. Refer to the seating systems owner's manual for removal/installation instructions.
   B. Remove the seat pan. Refer to REMOVING/INSTALLING THE SEAT PAN in PROCEDURE 6 of this manual.
2. Remove the motor. Refer to REMOVING/INSTALLING THE MOTOR in PROCEDURE 12 of this manual.
3. Cut the tie-wrap(s) that secure the wiring harness/ charger cable to the suspension arm.
4. Remove the anti-tip assembly from the rear of the suspension arm. Refer to REMOVING/INSTALLING THE ANTI-TIP ASSEMBLY in this procedure of the manual.
5. Remove the shock from the suspension arm. Refer to REMOVING/INSTALLING THE SHOCK ASSEMBLY in this procedure of the manual.
6. Remove the plug buttons from the side of the base frame.
7. Remove the mounting screw and beveled washers that secure the front of the suspension arm to the base frame.
8. Remove the existing suspension arm from the base frame.
9. Install the new suspension arm onto the base frame.
10. Install mounting screw and beveled washers that secure the front of the suspension arm to the base frame.
11. Install the plug buttons into the side of the base frame
12. Install the shock onto the new suspension arm. Refer to REMOVING/INSTALLING THE SHOCK ASSEMBLY in this procedure of the manual.
13. Install the motor onto the new suspension arm. Refer to REMOVING/INSTALLING THE MOTOR in PROCEDURE 12 of this manual.
14. Install anti-tip assembly onto the rear of the new suspension arm. Refer to REMOVING/INSTALLING THE ANTI-TIP ASSEMBLY in this procedure of the manual.
15. Perform one (1) of the following:
   A. Remove the seating system. Refer to the seating systems owner's manual for removal/installation instructions.
   B. Remove the seat pan. Refer to REMOVING/INSTALLING THE SEAT PAN in PROCEDURE 6 of this manual.

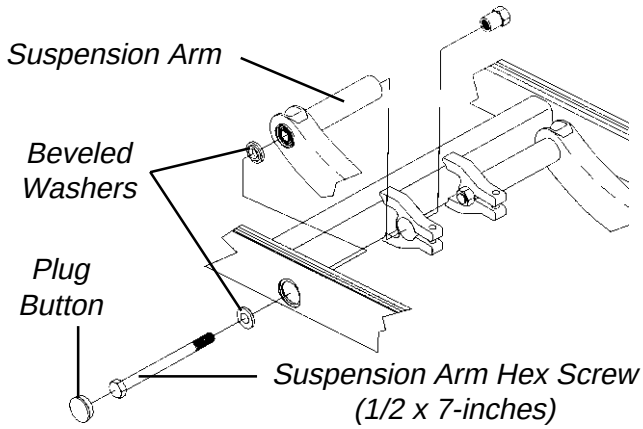


FIGURE 14 - REPLACING SUSPENSION ARM FOR WHEELCHAIRS WITH GEARLESS/BRUSHLESS MOTOR

ANTI-TIPPER WHEEL REPLACEMENT (FIGURE 15)

1. Remove the locknuts, hex screws and spacers that secure the anti-tipper wheels to the anti-tip bracket
2. Replace anti-tipper wheel(s) and torque existing hardware to 156-inch pounds. DO NOT overtighten.

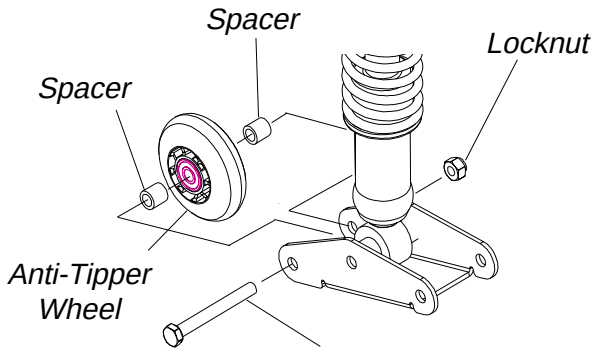


FIGURE 15 - ANTI-TIPPER WHEEL REPLACEMENT

REMOVING/INSTALLING THE 3-INCH ANTI-TIP ASSEMBLY (FIGURE 16)

1. Remove the 5/16-18x3-1/2-inch hex head cap screw, two (2) short spacers, two (2) large washers, and locknut that secure the rear of the anti-tip bracket and shock (or rubber element) to the suspension arm. Save hex head mounting screw, two (2) small spacers, and locknut for installation of the 4-inch active anti-tip assemblies.
2. Remove the 5/16-18x3-1/4-inch hex head cap screw, two (2) small washers, long spacer and locknut that secure the front of the anti-tip bracket to the the suspension arm. Save hex head mounting screw and locknut for installation of 4-inch active anti-tip assemblies.

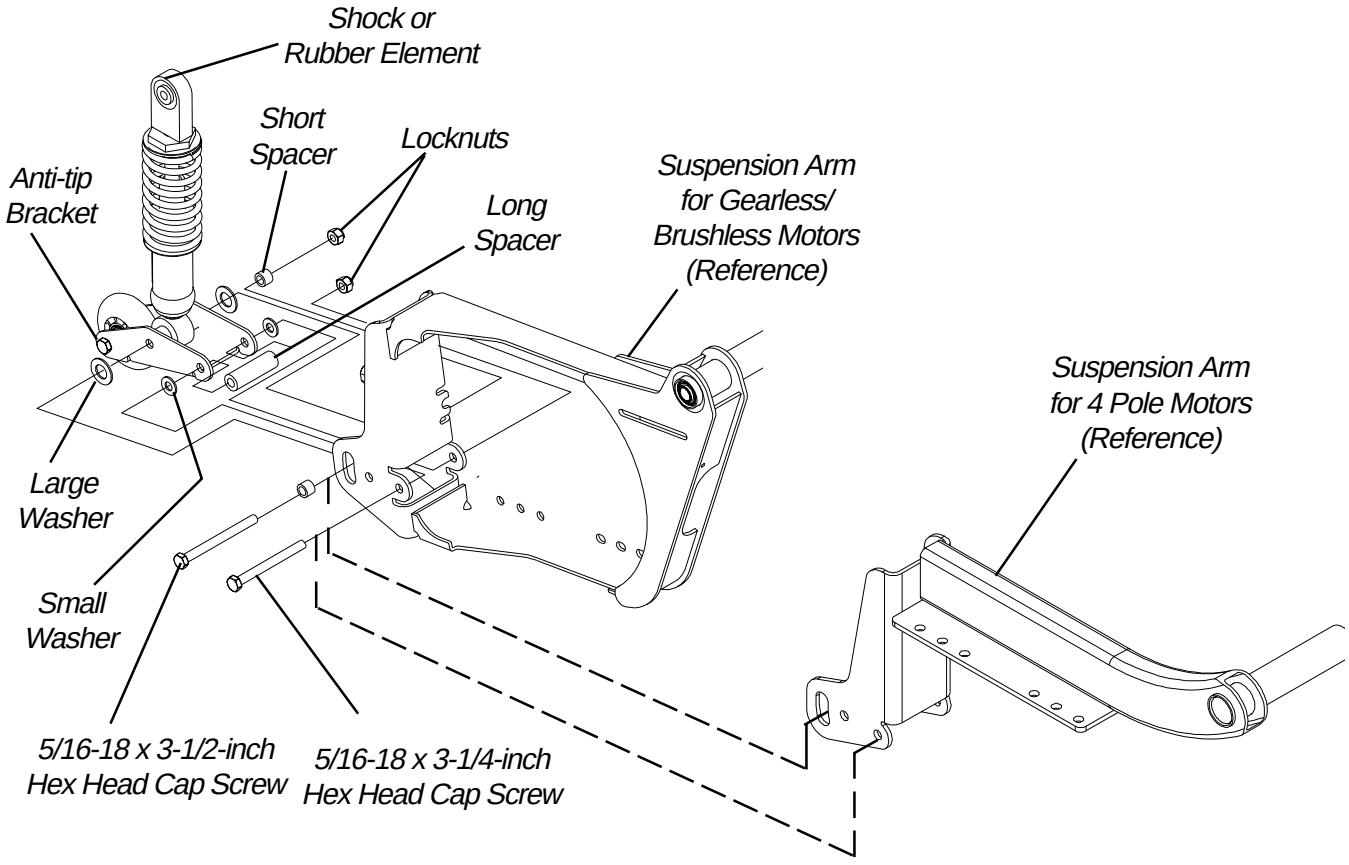


FIGURE 16 - REMOVING/INSTALLING THE 3-INCH ANTI-TIP ASSEMBLY

NOTES

LIMITED WARRANTY

PLEASE NOTE: THE WARRANTY BELOW HAS BEEN DRAFTED TO COMPLY WITH FEDERAL LAW APPLICABLE TO PRODUCTS MANUFACTURED AFTER JULY 4, 1975.

This warranty is extended only to the original purchaser/user of our products.

This warranty gives you specific legal rights and you may also have other legal rights which vary from state to state.

Invacare warrants seat frame to be free from defects in materials and workmanship for a period of three (3) years from date of purchase; that electrical components are warranted for a period of one (1) year; gearbox/motors for a period of 18 months; and gearless/brushless motors for five (5) years from the date of purchase; and the base frame for the life of the product; all remaining components (including gas cylinders and motor lock pads) for one (1) year from the date of purchase except upholstered materials, padded materials and tires/wheels. If within such warranty period any such product shall be proven to be defective, such product shall be repaired or replaced, at Invacare's option. This warranty does not include any labor or shipping charges incurred in replacement part installation or repair of any such product. Invacare's sole obligation and your exclusive remedy under this warranty shall be limited to such repair and/or replacement.

This warranty pertains to Arrow Series, Ranger X Series and Torque Series Only!

For warranty service, please contact the dealer from whom you purchased your Invacare product. In the event you do not receive satisfactory warranty service, please write directly to Invacare at the address at the bottom of the back cover. Provide dealer's name, address, date of purchase, indicate nature of the defect and, if the product is serialized, indicate the serial number. Do not return products to our factory without our prior consent.

LIMITATIONS AND EXCLUSIONS: THE FOREGOING WARRANTY SHALL NOT APPLY TO SERIAL NUMBERED PRODUCTS IF THE SERIAL NUMBER HAS BEEN REMOVED OR DEFACED, PRODUCTS SUBJECTED TO NEGLIGENCE, ACCIDENT, IMPROPER OPERATION, MAINTENANCE OR STORAGE, COMMERCIAL OR INSTITUTIONAL USE, PRODUCTS MODIFIED WITHOUT INVACARE'S EXPRESS WRITTEN CONSENT INCLUDING, BUT NOT LIMITED TO, MODIFICATION THROUGH THE USE OF UNAUTHORIZED PARTS OR ATTACHMENTS; PRODUCTS DAMAGED BY REASON OF REPAIRS MADE TO ANY COMPONENT WITHOUT THE SPECIFIC CONSENT OF INVACARE, OR TO A PRODUCT DAMAGED BY CIRCUMSTANCES BEYOND INVACARE'S CONTROL, AND SUCH EVALUATION WILL BE SOLELY DETERMINED BY INVACARE. THE WARRANTY SHALL NOT APPLY TO PROBLEMS ARISING FROM NORMAL WEAR OR FAILURE TO ADHERE TO THESE INSTRUCTIONS.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS WARRANTIES. IMPLIED WARRANTIES, IF ANY, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, SHALL NOT EXTEND BEYOND THE DURATION OF THE EXPRESS WARRANTY PROVIDED HEREIN AND THE REMEDY FOR VIOLATIONS OF ANY IMPLIED WARRANTY SHALL BE LIMITED TO REPAIR OR REPLACEMENT OF THE DEFECTIVE PRODUCT PURSUANT TO THE TERMS CONTAINED HEREIN. INVACARE SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES WHATSOEVER.

THIS WARRANTY SHALL BE EXTENDED TO COMPLY WITH STATE/PROVINCIAL LAWS AND REQUIREMENTS.

Invacare Corporation www.invacare.com

USA
One Invacare Way
Elyria, Ohio USA
44036-2125
800-333-6900

Canada
5970 Chedworth Way
Mississauga, Ontario
L5R 3T9, Canada
905-890-8838

Invacare, Storm Series, Arrow are registered trademarks and Ranger X, Torque and Yes, You can are trademarks Invacare Corporation.
Loctite is a registered trademrk of Loctite Corporation.
©2001 Invacare Corporation
Form No. 01-015 Part No. 1104849 Rev A (1)-4/01